INSTALLATION, OPERATION AND MAINTENANCE MANUAL FOR HM-4119 SERIES COLOR MONITORS

HITACHI

OM-1367E

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1. MONITOR SPECIFICATION

1.1 TECHNICAL FEATURES

The HM-4119 Color monitor is designed to be a high performance, compact and economical color monitor with in-line gun and provides the following features.

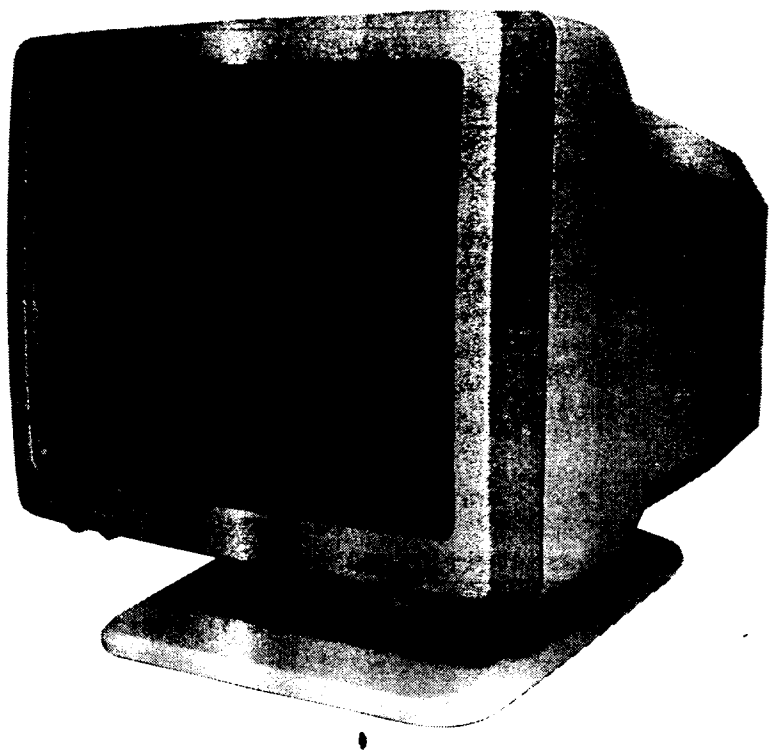
ELLIPTICAL APERTURE TUBE
and 0.31 mm trio dot provides wide and sharp image.

60 Hz NON-INTERLACE
provides flicker-free images.

100 MHz VIDEO BANDWIDTH
achieves clear and fine images.

COMPACT MODULE CONFIGURATION
provides high reliability and easy maintenance.

MODEL HM-4119 COLOR MONITOR



1.2 TECHNICAL SPECIFICATIONS

1.2.1 CRT Specifications

(1) Size
* 20 inch (19 V diagonal)

(2) Electron Gun
* Precision In-line

(3) Convergence
* Self-convergence, ITC (Integrated Tube Component) Type

(4) Focusing
* Electrostatic focusing

(5) Deflection
* Electromagnetic deflection

(6) Deflection Angle
* 90 degrees

(7) Dot Trio Pitch
* 0.31 mm

(8) Phosphor Characteristics
* Standard persistence p22, Dot type black matrix

TYPE	FLUORESCENT COLOR		C.I.E. COORDINATES X	C.I.E. COORDINATES Y	PERSISTENCE CHARACTERISTIC	DELAY TIME
NP	R.G.B.	R	0.610	0.342	Medium Short	1.2 msec
		G	0.298	0.588		300 µsec
		B	0.151	0.064		250 µsec

(9) Implosion Protection
* Banded type with mounting lugs

(10) Orientation
* Long dimension horizontal

(11) Face Place Options
a) Glare reduced with High Contrast
* with anti-reflection corting panel [System transmission 72%] (option)

b) Normal surface clear glass [System transmission 85%]

1.2.2 Signal Input Characteristics

(1) Video Signal Inputs:
a) Type
* Red - R
* Green - G
* Blue - B

Note : Composite SYNC signal will be taken from the Green Video signal line.

b) Level (AC coupled input)
* Composite : 1.0 Vp-p Nominal (0.7-1.4 Vp-p)
* Non-composite : 0.7 Vp-p Nominal (o.5-1.0 Vp-p)

c) Signal polarity
*R.G.B. : Positive bright
d) Impedance
* Terminated : 75 ohms ± 2%
* Unterminated : Greater than 10 Kohms switch selectable

(2) SYNC Signal
a) Type
* Composite on Green or H.V. mixed external sync or H.V. separate external sync; Switch selectable
b) Level
* Composite : SYNC to total signal ratio = 28.6 ± 5%
* External : DC coupled TTL level
(H.V. mixed and H.V. separated)
c) Signal polarity
* Negative
d) Impedance
* Terminated : 75 ohms ± 2%
* Unterminated : Greater than 4 Kohms switch selectable

(3) Connectors
* BNC type receptacle for each R.G.B. video signals and external SYNC signals.

(4) Signal Wave Form
* EIA RS-343A compatible

1.2.3 Electrical Performance

(1) Resolution
* 1,280 × 1,024 pixels [64 KHz version]
* 1,024 × 768 pixels [50 KHz version]

(2) Scanning Frequency (Refer to recommended timing)
* Horizontal : Point design for user timing
* Vertical : 55 - 65 Hz

(3) Retrace Time
* Horizontal retrace : 3.2 µsec. max. (including settling time : 3.5 µsec. max.) [64 KHz version]
: 3.5 µsec. max. (including settling time : 4.0 µsec. max. [50 KHz version]
* Vertical retrace : 450 µsec. max. (including settling time : 550 µsec. max.)

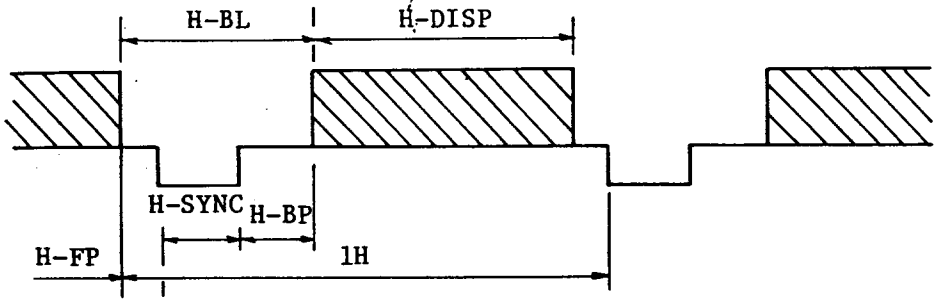
(4) Video Amplifier
* Bandwidth
at 3dB down : 15 Hz to 100 MHz [64 KHz version]
: 15 Hz to 70 MHz [50 KHz version]
* Rise/Fall time : 5.0 nsec. max. [64 KHz version]
: 6.0 nsec. max. [50 KHz version]
* Overshoot : 10% max.
* Sag : No greater than 5% of full scale

1.2.4 Display Performance

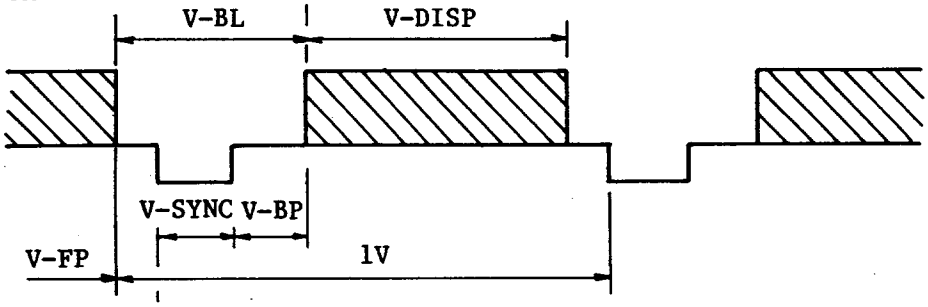
(1) Active Display Area
* Horizontal : 340 mm ± 2% [64 KHz version]
: 360 mm ± 2% [50 KHz version]

RECOMMENDED TIMING

HORIZONTAL

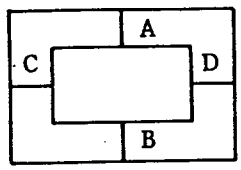


VERTICAL



	ITEM	EQUATION	RATING (64 KHz Version)	RATING (50 KHz Version)	UNIT
a	Resolution H		1280	1024	Pixel
b	Resolution V		1024	768	Pixel
c	Pixel rate		9.296	15.625	ns
d	Pixel freq.	1/C	107.573	64.0	MHz
e	H-DISP	a × c	11.899	16.0	μs
f	H-BL	g + h + i	3.800	4.5	μs
g	H-FP		0.200	1.0	μs
h	H-SYNC		1.600	2.0	μs
i	H-BP		2.000	1.5	μs
j	IH		15.699	20.5	μs
k	H freq.	1/j	63.7	48.8	KHz
l	V-DISP	b × j	(1024H)	(768H)	ms
m	V-BL	n + o + p	(37H)	(45H)	ms
n	V-FP		(0H)	(6H)	ms
o	V-SYNC		(3H)	(6H)	ms
p	V-BP		(34H)	(33H)	ms
q	IV	l + m	(1061H)	(813H)	ms
r	V freq.	1/q	60.0	60.0	Hz

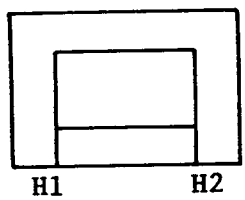
* Vertical : 270 mm ± 2%
* Centering



| A-B | ≦ 6 mm
| C-D | ≦ 8 mm

(2) Convergence
* Zone A : 0.3 mm
(in a central area bounded by a circle 270 mm in diameter)
* Zone B : 0.5 mm
(Outside the circle)

(3) Raster Distortion
* No point on the raster will deviate from its proper position by more than 1.5% of radter height.
* Rotation



| H1-H2 | ≦ 3 mm

* Linearity : With test signal (1" pitch closs-hatch) applied, the maximum and minimum internal anywhere on the screen is

$$\frac{MAX-MIN}{MAX+MIN} \times 100 \leqq 5\% \text{ (Horizontal and Vertical)}$$

(4) Raster Size Regulation
* Less than 1% of max. rester dimension change with 0 to 100% APL

(5) Brightness
* No less than 25 ft-L with glare reduced high contrast glass tube
* No less than 30 ft-L with normal surface clear glass tube

(6) Colorimetry
* 6.550° K + 7 MPCD (X = 0.313, Y = 0.329) C.I.E. coordinates (standard) or
9,300° K + 27 MPCD (X = 0.281, Y = 0.311)

(7) Black level Stability
* Less than 1% of peak luminance from 10% to 90% APL

(8) Brightness Uniformity
* No less than 50% of peak luminance

(9) Emission Warm Up Time
* Less than 20 sec.

(10) Warm Up Time
* 20 min. for stable display performance

(11) Phosphor Protection
* Power ON/OFF transient

* Loss of SYNC Input
* Damage in deflection circuits

(12) Degaussing
Automatic and manual, less than 15 seconds duration

1.2.5 User Controls and Indicators

* Power ON/OFF Switch
* Power ON Indicator
* Contrast Control
* Brightness Control
* Manual Degauss Button

1.2.6 Primary Power Requirement

(1) Voltage Range
* 87 - 132 V AC or 175 - 264 V AC, switch selectable

(2) Frequency
* 47 - 63 Hz

(3) Power Consumption
* Normal : 140 W / 200 VA
* Maximum : 175 W / 250 VA

Note : Nominal value is specified when characters are displayed. Maximum value is specified when full white signal is displayed under rated brightness.

(4) Power Inrush Current
* Power ON : Less than 35 A
* Manual Degauss : Less than 20 A

1.2.7 Environmental Requirement

(1) Temperature
* Operating : 0 - 40° C (with cabinet)
: 0 - 50° C (without cabinet)
* Strage : -40 - 70° C

(2) Humidity
* Operating : 10 - 90% no condensation
* Storage : 10 - 90% no condensation

(3) Altitude
* Operating : 10,000 feet
* Shipping : 35,000 feet

(4) Shock
* 10 G

(5) Vibration
* 0.5 G

1.2.8 Mechanical Guidelines

(1) Weight
* Bare type : Approx. 29 kg
* Cabinet type : Approx. 35 kg

(2) Size (W, H. D)
* Bare type : 447.7 × 366 × 520 mm
* Cabinet type : 484 × 481 × 532 mm

Detailed drawings are as per 1.2.11 Reference Drawings.

1.2.9 Reliability and Safety

(1) Mean Time Between Failure (MTBF)
* 35,100 hours as calculated using MIL-HDBK-217D parts count prediction.

(2) X-ray Radiation
* Less than 0.5 mR/Hr, to comply with DHHS rules 21 CFR, subchapter J.

(3) RF Emission
* FCC Class A commercial, industrial or business environment equipment
* VDE 0871/6.78 class A

(4) Safety Regulations (Pending)
* UL478 safety specification for electronic data processing units and systems
* CSA C22, 2-154 safety requirements for data processing
* VDE 0806
* IEC 380
* PTB

1.2.10 Model Numbers and Options

Options are put in the monitor during production and should therefore be specified when order is placed.

HM-4119 - (a) - (b)(c) - (d)

(a) Mechanical configuration
F : Bare type with Pin Jack connector on Video Amp
R : Bare type with BNC connector on Video Amp
B : Bare type with operator control switches and knobs on the rear panel and with BNC connector on Video Amp
D : Plastic cabinet type

(b) Picture tube
A : Normal phosphor with anti-reflection coating panel
B : Normal phosphor normal surface clear glass

(c) Electrical Specifications
A-Z : Letter to identify electrical specifications

(d) Electrical Specifications
Letter to identify other specifications according to user's requirements
(1) 0 - 9, A - M (now available for 64 KHz version)
(2) L - Z (indeveloping, for 50 KHz version)

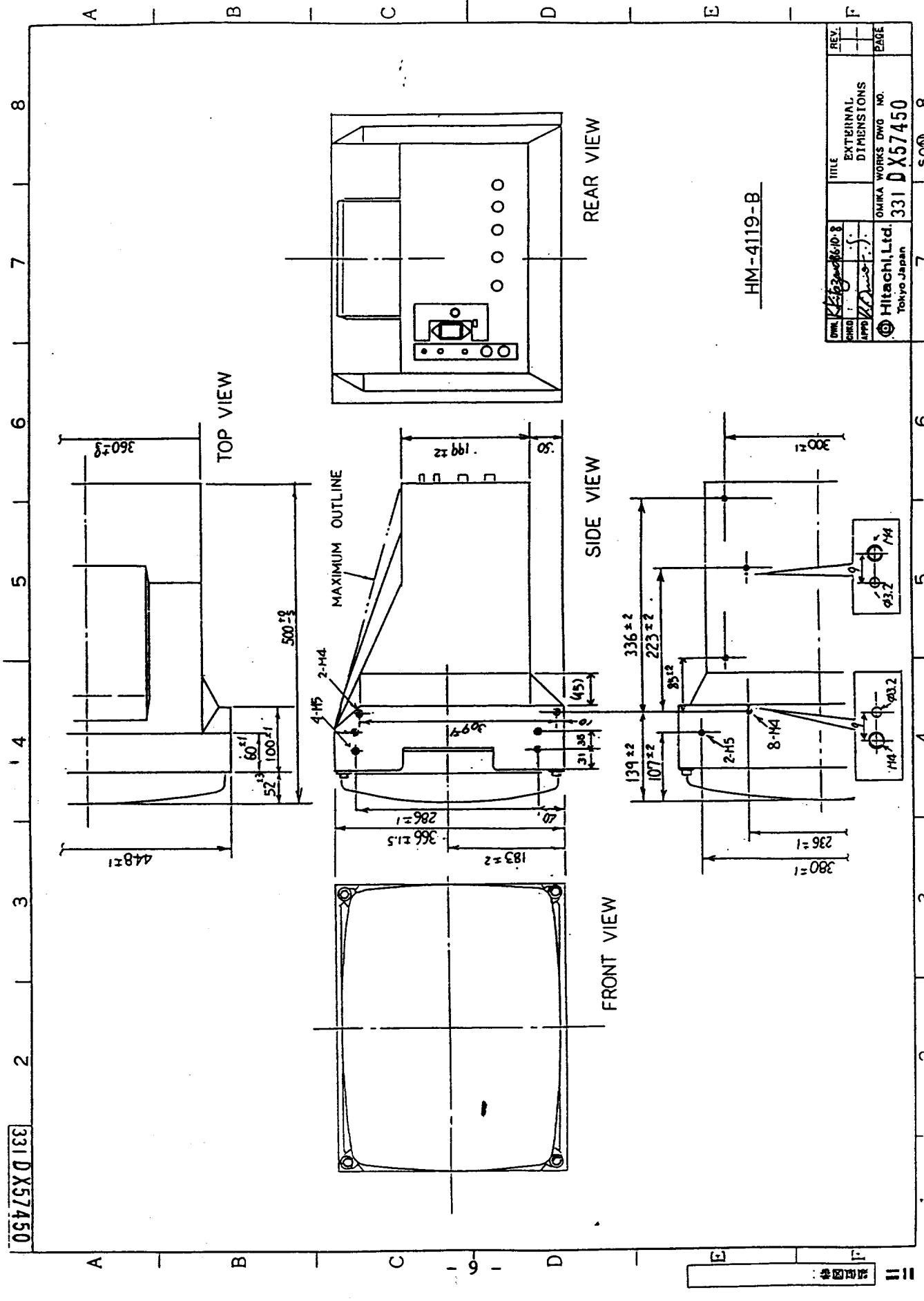
1.2.11 Reference Drawings

1. External Dimensions for HM-4119-B . DWG. No. 331D X 57450

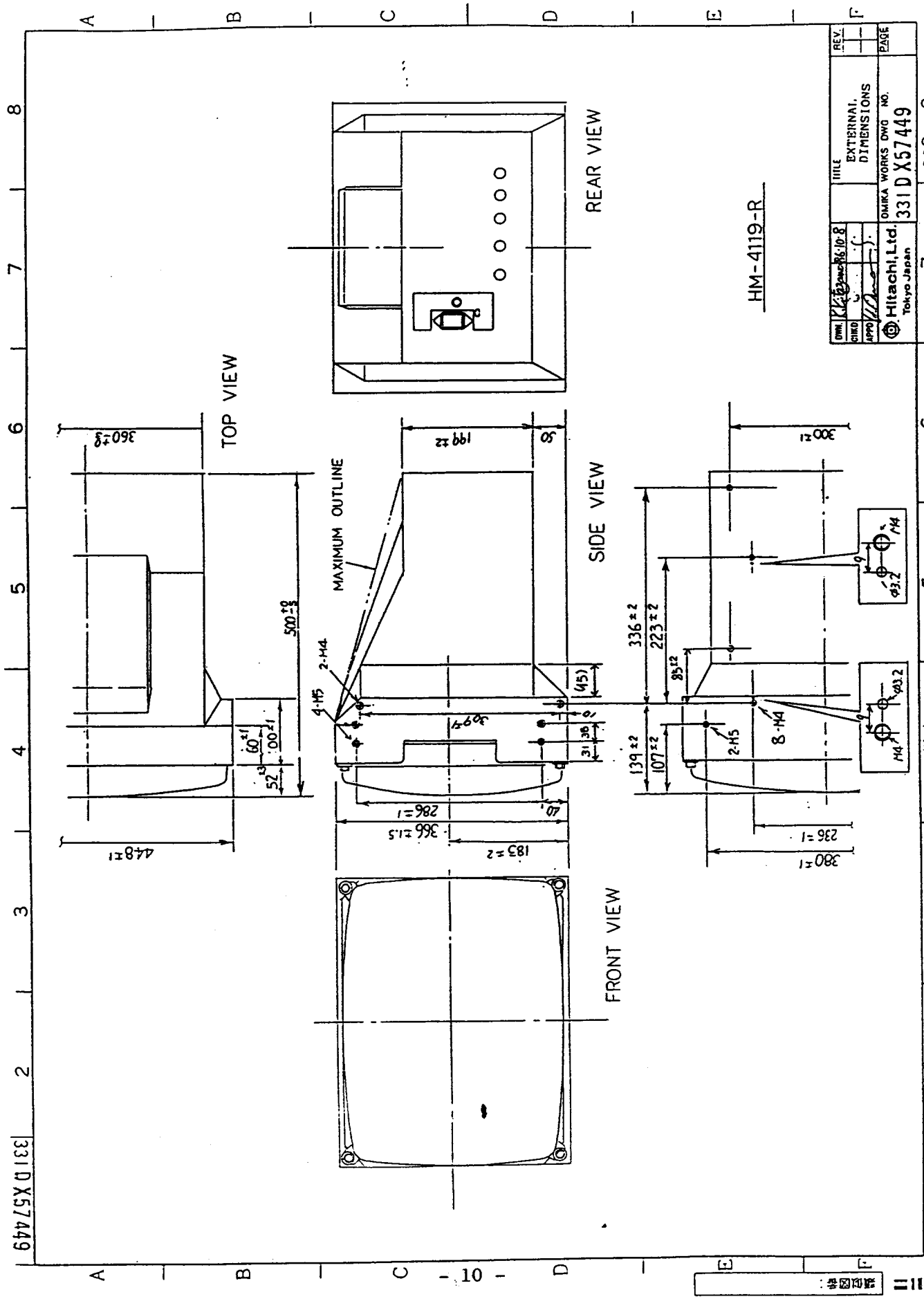
2. External Dimensions for HM-4119-R DWG. No. 331D X 57449
3. External Dimensions for HM-4119-D DWG. No. 331D X 55180
4. Remote Panel Interface for HM-4119-F/R DWG. No. 331D X 54949

Note : When putting the monitor in the user's cabinet, the dimensions should not interfere with the maximum outline of the monitor.

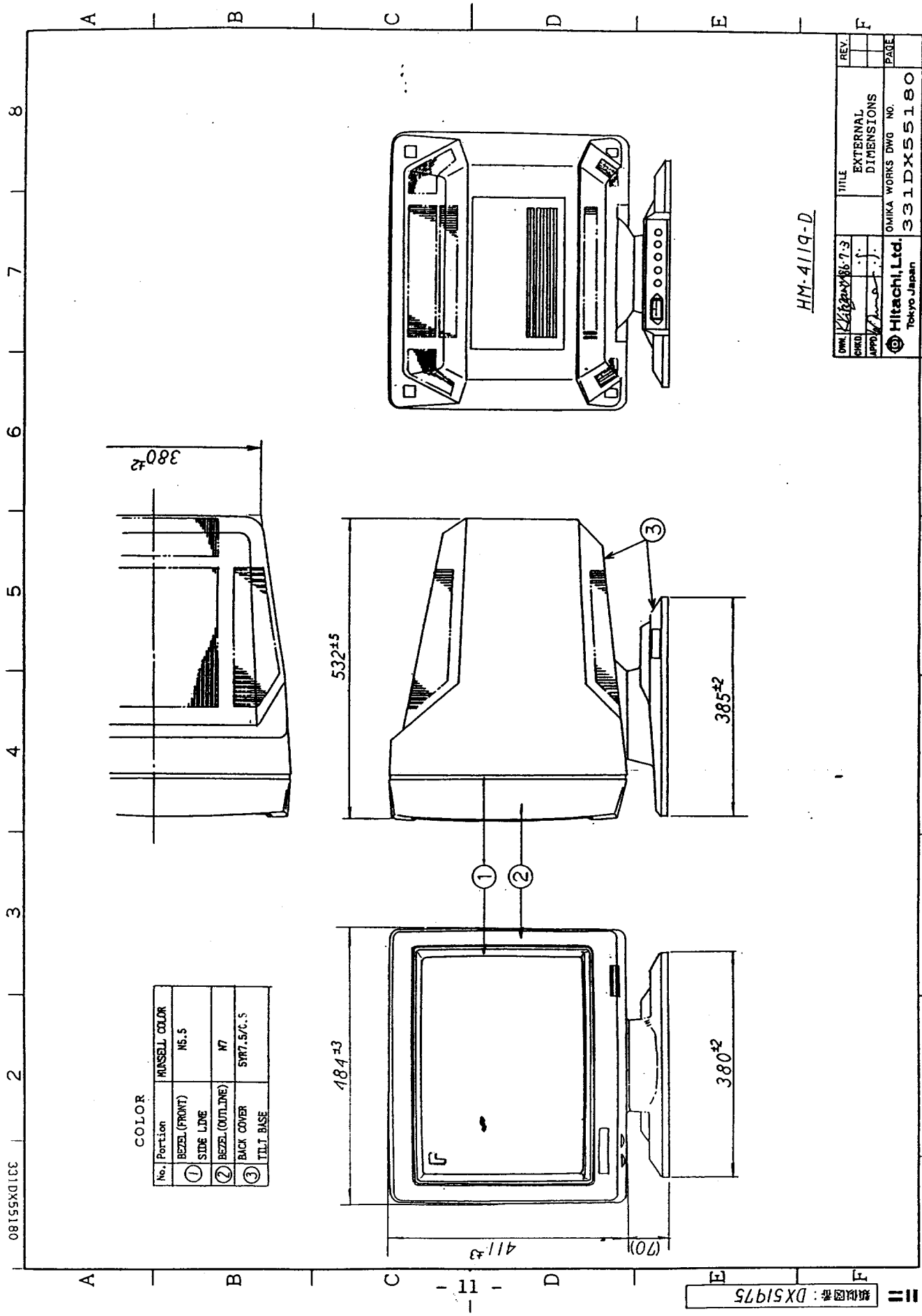
External Dimension HM-4119-B

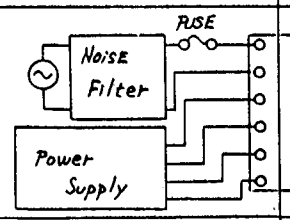
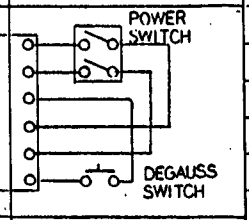
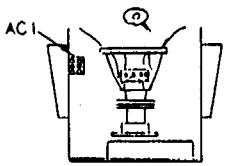
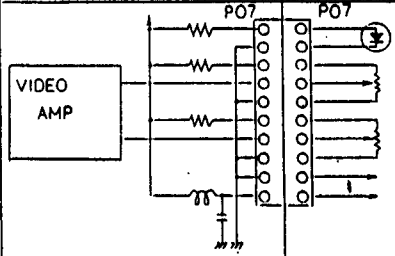
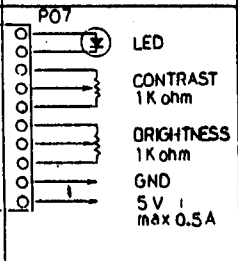
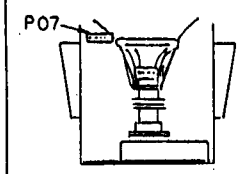


External Dimension HM-4119-R



External Dimension for HM-4119-D



	CONNCTOR No.	HM-4115/HM-4119 MONITOR	REMOTE PANEL CONNECTIONS	PARTS NAME	REQUIRED RATING	RECOMMENDED PARTS TYPE	RECOMMENDED PARTS MANUFACTURE
1	AC1			CONNECTOR HOUSING		MLP-06	JAPAN SOLDERLESS TERMINAL MFG
				CONTACT		LLFO1T-1.3	Ditto
				POWER ON/OFF SWITCH	250V, 4A	NE15 ALTERNATE	KITAKAMI TOKO INC.
				DEGAUSS SWITCH	250V 4A	NE15 MOMENTARY	Ditto
				WIRE		AWG 20	HITACHI CABLE LTD
							
2	P07			CONNECTOR		10NR-D2R	JAPAN SOLDERLESS TERMINAL MFG
				BRIGHTNESS VR	1K ohm	EVH60AF15B13	MATSUSHITA ELECTRIC COMPONENTS CO., LTD
				CONTRAST VR	Ditto	Ditto	Ditto
				LED		BD 703G	OKAYA ELECTRIC INDUSTRIES CO., LTD
				WIRE		AWG 22	HITACHI CABLE LTD.
							

REMOTE PANEL INTERFACE HM-4115/4119

DWN	T.Ohuchi	86.9	TITLE: INTERFACE
CHKD	K.Yamashita		REV.
APPD	S.Okuma		
Hitachi, Ltd. Tokyo Japan			OMIKA WORKS DWG. NO. 331DX54949
			PAGE

Remote Panel Interface for

5414187 類似図番：

2. INSTALLATION OF MONITOR

2.1 INSTALLATION PRECAUTION

The convergence of color monitor is subject to the influence of external inductive fields. Avoid installing the unit in areas where inductive fields are present. The following additional items will ensure proper monitor operation:

a. Ventilation:
For long time stable operation the temperature inside the case must be kept below 50°C.
Specifically, when this monitor is mounted in a cabinet, it must have vertical ventilation, both above and below. If there is insufficient space between the monitor and its surroundings, a cooling fan is recommended.

b. Leakage flux:
Do not install the monitor in areas where a transformer, fan or other leakage flux source will be nearby. The AC leakage flux causes fluctuation of the picture, and DC flux (magnet or the like) causes raster distortion and makes the purity of the picture worse. If it is necessary to mount such a device in these environment the following minimum requirements must be met. For a transformer, attach to it a shield ring and shorting ring, and design its windings in a balanced type to minimize leakage flux. For devices other than transformers, minimize leakage flux by means of a magnetic shield or non-inductive windings.
The color monitor is susceptible to the influence of external magnetic fields.
To eliminate misconvergence avoid installing the unit close to an inductive magnetic field. A magnetic field of more than 0.01 gauss which will cause noticeable distortion.

c. High vibration:
Although this monitor is designed to withstand vibration, it is still advisable to mount it on a vibration preventive base for long-time stable operation especially when it is installed on a vehicle or the like. The same caution should be exercised when there is a source of vibration in the vicinity.

d. Humidity:
This monitor can be operated within a relative humidity range of between 10 and 90%.
If it is operated in a humid environment for a long time, however, its life time may be shortened by deterioration of connector contacts or rheostats. It is, therefore, advisable to operate the unit in a humidity range of between 30 and 70%.

e. Ambient illumination:
This monitor employes a black matrix color picture tube which provides excellent resistance to glare or reflection in high ambient light.
It is, however, still advisable to avoid direct light sources shining onto the CRT screen in order to prevent eye fatigue.

f. Dust:
This monitor is designed to minimize dust collection. Because of the high static electric fields, dust will be attracted through the cabinet ventilation holes. Precautions, therefore, should be taken to minimize dust in the vicinity.
It is advisable to periodically clean the anode cap of the CRT which tends to collect dust electrostatically.

g. Power voltage
The picture is not influenced by a voltage fluctuation within specification, because this monitor incorporates a voltage regulator circuit.
Operation over +10% should be avoided, however, because of excessive heating in the interior and incidental detriment to the life time of the unit.
Either 50 Hz or 60 Hz can be used without any modification of the unit.

h. CRT screen dirt
As hypertension is applied, the CRT screen tends to colloct dirt, which degrades brightness and focus.
Especially with A/R PANEL type, don't touch the surface of the screen because soiling and fingerprints degrade the effectiveness of the anti reflection.
Use of soft cloth dampened with a silicone type glass cleaner is recommended for periodic removal of this dirt. Do not use a thinner or the like instead of a cleaner. The static charge on the CRT screen may result in a shock if the screen is touched in a low-humidity environment. To avoid this, prepare a wet towel (wrung tightly), touch one end of it to the case and the other end to the CRT screen and press lightly to cause discharge.

2.2 SAFETY PRECAUTION

Notice: Comply with all cautions and safety related notices, located on the chassis or the CRT tube.

a. Dangerous voltage exists within the display unit and the pedestal. Normal electrical precaution should be observed whenever working within those units while the covers are removed.

b. Disconnect the power source of the monitor before removing or replacing circuit modules and components.

c. Caution must be exercised during the replacement or servicing of the CRT since a residual electrical charge may be contained on the anode button.

d. The soldering tool and measuring instruments should be grounded.

e. Always use the manufacturer's replacement components, especially critical components as indicated on the circuit diagram should not be replaced with other components of other makes.

2.3 PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in the monitor units have special safety related characteristics. These are often not evident

from visual inspection nor can the protection afforded by them necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this Manual.

Electrical components having such features are identified by a special marking on the schematics and on the parts list in this Manual.

The use of a substitute replacement component which does not have the same safety characteristics as a recommended replacement one, shown on the parts list in this Manual, may create shock, fire, X-radiation, or other hazards.

Product Safety is continuously under review and new instructions are issued from time to time. For the latest information, always consult this Manual.

a. X-ray radiation
This unit complies with U.S. Department of Health, and Human Services X-ray radiation safety rules, 21 CFR, subchapter J.
TUBE: The Primary source of X-radiation in this unit is the CRT tube. The tube utilized in this unit is specially constructed to limit X-radiation emissions. For continued X-radiation protection, the replacement tube must be the same type as the original type.

2.4 INFORMATION TO USER FOR FCC

This equipment complies with the requirements in part 15 of FCC Rules for class A computing device provided that the following conditions are met in using this monitor:

(1) For video signal cables, double shield coaxial cable (FCC shielded cable) should be used as video signal cable and the outer shield should be connected to the earth.
or
In case of use of normal coaxial cable for video signal cable, the cable should be shielded with metal pipe or similar way for reduction of interference noise.

(2) For rackmount type, metal cabinet should be used for reduction of interference noise. Approximate one (1) to two (2) mm thickness is adopted to cabinet type monitor as usual. Please prepare cabinet to be thick enough for shielding purposes.

2.5 UNPACKING

2.5.1 Package

The monitor is packaged in a carton box and its dimensions and weight are as follows.

Dimensions:

Width	mm
Height	mm
Depth	mm

Weight:

	Net Weight	Gross Weight
Bare type	29 kg	kg
Cabinet type	35 kg	kg

Standard accessories of 1 fuse and 1 manual are also packed in the carton box.

2.5.2 Unpacking

a. The packing weight of the carton box is more than 20 kg. Therefore it is recommended that it be handled by two men.

b. Unpack the monitor carefully and do not scratch or strike the picture tube face.

c. Please read the Section 2 before connecting the color monitor to any AC power supply.

Packing Procedure (HM-4119-D)

Packing Procedure (HM-4119-F/R/B)

2.6 INTERFACING

2.6.1 Input Signals

Connect red, green, blue video and sync input to the appropriate connectors on the rear connector panel as shown in Fig. 2-2.

2.6.1.1 Sync Selection

Synchronous input is possible for among the composite sync on green signal, H.V. mixed external synchronous signal and H.V. separate external synchoronous signal with switch selection.

Set SYNC SELECTION SWITCH (SW403) to the upper position for composite sync and set to the center position for H.V. mixed sync and down position for H.V. separate sync, as shown in Fig. 2-2.

2.6.1.2 Termination Switches

There are switches which select the video and sync line impedance, that is 75 OHM (upper side) or High (lower side) respectively as shown in Fig. 2-2, and they are set to 75 OHM when the monitor is delivered from the factory.

For loopthrough connection, a T connector may be used, and High impedance shall be selected except in the case of the last monitor in line.

NOTICE

Loopthrough connection may degrade the picture performance

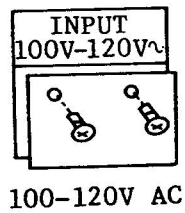
2.6.2 AC Power Source

WARNING

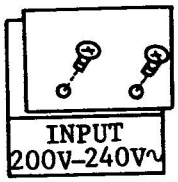
Before making connection to the power source, confirm that the monitor is set to match the voltage of the power source.

2.6.2.1 Voltage Selection Switch

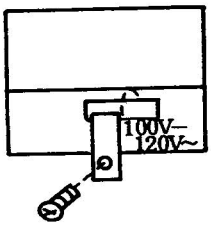
When the rated voltage needs to be changed, the VOLTAGE SECTION SWITCH should be set to the appropriate voltage selection. The proper size fuse should be installed and the rating identification plate on the rear panel should be changed to reflect the proper voltage selection as shown Fig. 2-2.



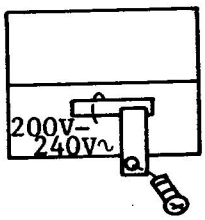
100-120V AC



200-240V AC

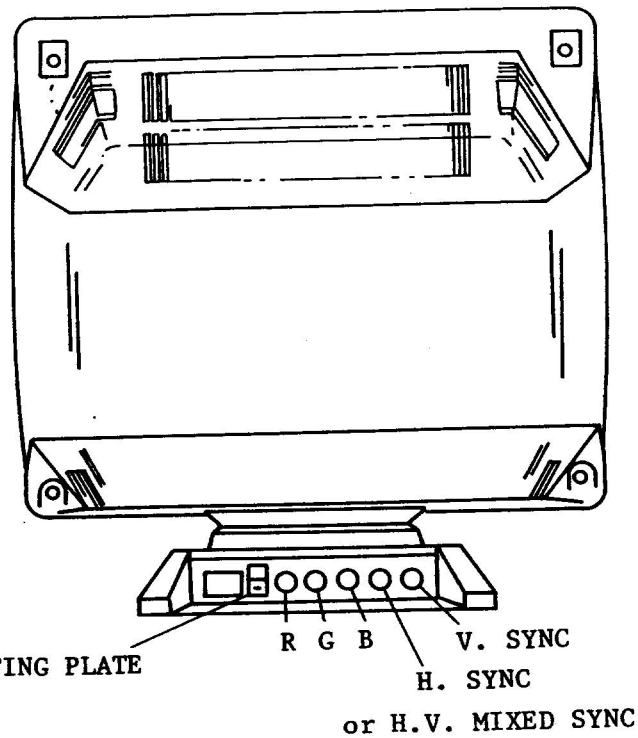


100-120V AC

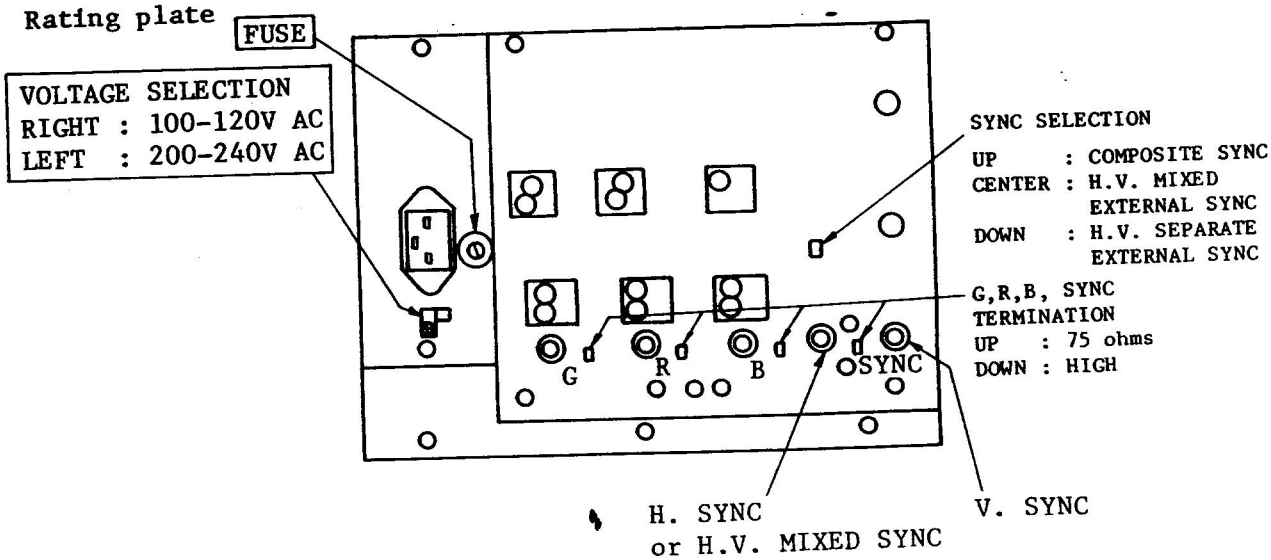


200-240V AC

(c) Rating plate



(a) Cabinet type



(b) Bare type

Fig. 2-2 REAR OF MONITOR

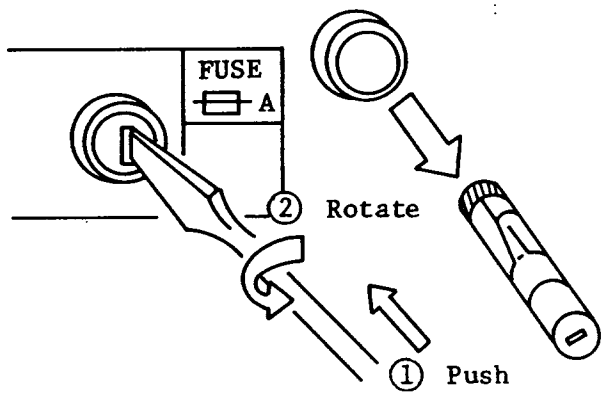
2.6.2.2 Fuse

When the usage of the monitor is required to change, or it's maintenance. Please replace the input fuse and fuse cap to proper type as shown following table.

Table 2-1

Usage	Area	North America		Europe	
	Input voltage	100V-120V	200V-240V	100V-120V	200V-240V
Required Fuse Type	Rating	250V, 3A or 250V, 3.15A	250V, 2A	250V, 3A or 250V, 3.15A	250V, 2A
	Blow characteristic	Medium blow or Slow blow	Slow blow	Medium blow or Slow blow	Slow blow
	Fuse Size (mm)	φ6.35×32		φ5×20	
Recommended Fuse and Fuse cap	Recommended Fuse (Manufacturer)	MGC 250V 3A (TOYO FUSE)	FST-UL, 250V, 2A Cat.No 034.3470 (SCHURTER)	FST 250V, 3.15A Cat.No 034.3122 (SCHURTER)	FST 250V, 2A Cat.No 034.3120 (SCHURTER)
	Fuse Cap (Manufacturer)	FEK 031.1661 (SCHURTER)		FEK 031.1663 (SCHURTER)	
	Appliable Standars	UL, CSA		TUV (VDE)	

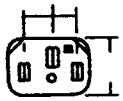
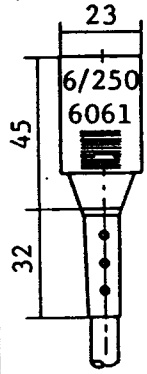
Caution : Disconnect the power code from the power line when checking or replacing the fuse.



2.6.2.3 Power supply cord

Plug identification as shown Table 2-2.

Table 2-2 POWER CORD AND PLUG IDENTIFICATION

INPUT RATING	PLUG CONFIGURATION	REFERENCE STANDARDS	CODE AND CONNECTOR
100V-200V 100V-120V	 North American	[1]ANSI C73.11 [2]NEMA 6-15-P [3]IEC 83	 a = 7±0.05 b = 7±0.05 c = 15.8 Three wire power code with a two-pole three terminal grounding type connector
200V-240V	 North American	[1]ANSI C73.11 [2]NEMA 6-15-P [3]IEC 83	 23 6/250 6061 45 32 Rating 250V AC, 6A
	 Universal Euro	[4]CEE (7) II, IV, VII [3]IEC 83	
	 UK	[5]BS 1365 [3]IEC 83	
	 Australia	[6]AS C112	

[1]ANSI-American National Standards Institute
[2]NEMA-National Electrical Manufacturer's Association
[3]IEC-International Electrotechnical Commission
[4]CEE-International Commission on Rules for the Approval of Electrical Equipment
[5]BS-British Standards Institution
[6]AS-Standards Association of Australia

2.6.3 Remote Panel Interface

For the bare type monitor, the POWER ON/OFF switch, DEGAUSS switch, BRIGHTNESS and CONTRAST controls should be attached for the monitor operation. Interface specifications are as per 1.2.11 Reference Drawings.

2.7 INSTALLATION CHECKOUT

Connect the monitor to an AC power source and turn the POWER switch to the ON position. Display a test pattern or some other suitable video signal to the video inputs. There is normally a twenty (20) seconds delay from power on to get stable picture. A twenty (20) minutes warm up time is required to get stable picture performance. Adjust the Brightness and Contrast for the desired viewing level. If the color purity or the convergence appear to be slightly out of adjustment, depress the Degaussing switch, hold it for several seconds and then release it. The image will be improved noticeably. If the monitor does not display an image, or if the displayed image is distorted and cannot be corrected, please refer to the maintenance procedures.

3. THEORY OF OPERATION

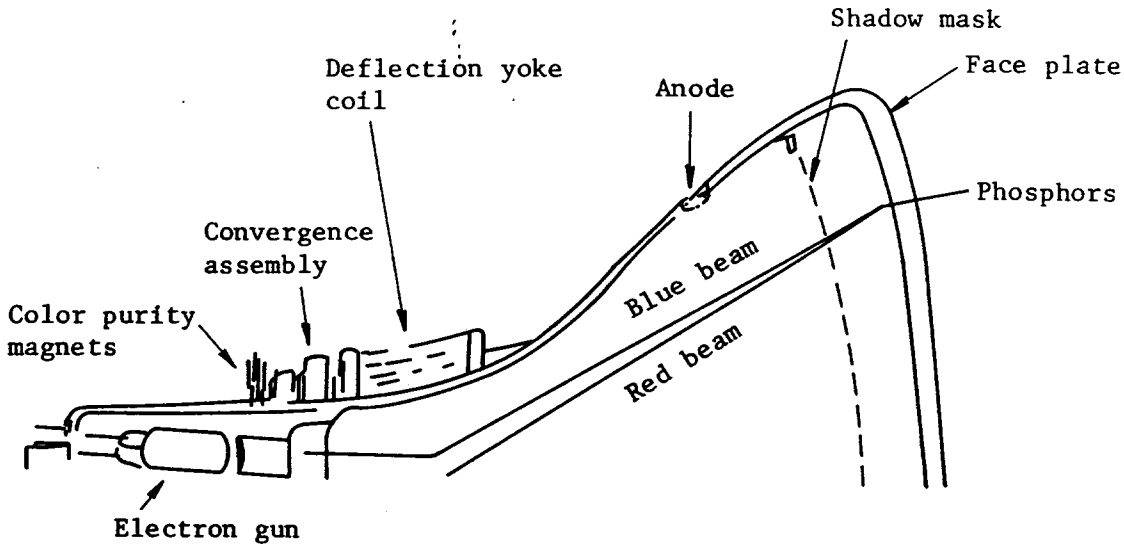
3.1 General

This color monitor consists of seven major models and the over-all block diagram is shown Fig. 7-1.

3.2 CRT (Refer to Fig. 3-1)

The CRT tube is designed to make beam spots applying electron rays from the electron gun to the fluorescent screen and to produce pictures by tracing the movement of those beam spots as the electron rays are deflected by the deflection yoke.

The CRT tube is composed of a phosphor screen painted in three colors, a shadow mask, and an electron gun that emits three electron beams. A three-beam electron gun has an inline arrangement where the sections of three electron beams are arranged on one straight line horizontally.


Shadow mask
Face plate
Deflection yoke coil
Anode
Phosphors
Convergence assembly
Blue beam
Color purity magnets
Red beam
Electron gun

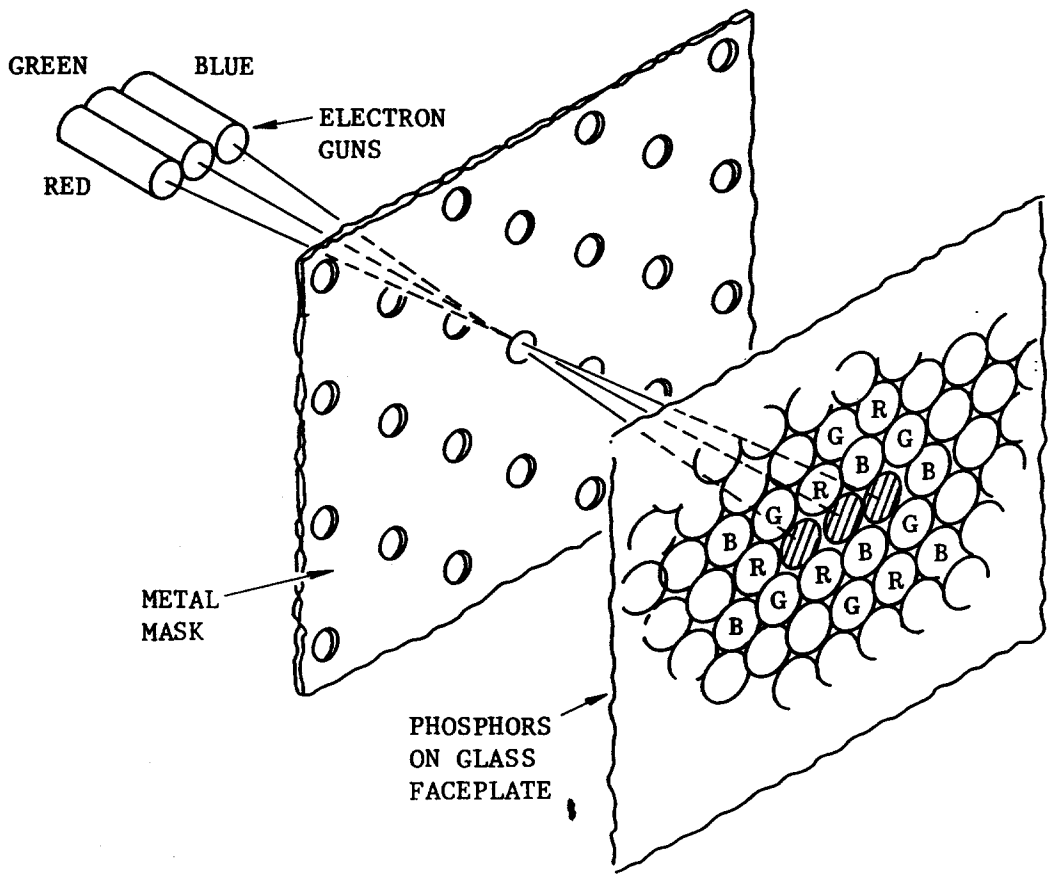

GREEN
BLUE
ELECTRON GUNS
RED
METAL MASK
PHOSPHORS ON GLASS FACEPLATE
R
G
B

Fig. 3-1

3.3 LOW VOLTAGE POWER SUPPLY MODULE

3.3.1 Main Block

Input voltage (100/120V AC or 200/240V AC) is supplied through the filter and inrush limit circuit. And that is rectified and smoothed by the rectification diode D100 and input capacitors C103 and C104 to provide a DC coarse-rectified voltage which will be switched by main transistor Q100, Q101, and delivered as P120(+120V), P60(+60V), P24 (+24V), P5(+5V).

3.3.2 Control Block

P120 output voltage is fed to a detector circuit, and compared with it's reference voltage. An error signal from the detector circuit is fed back to the switching control circuit through a photocoupler PHC1. The switching control circuit generates an appropriate drive pulse to control the ON time of the main transistors Q100, Q101 therefore, stabilizing the output P120. The switching frequency is so controlled as to be synchronous with horizontal deflection signal.

3.3.3 AC Voltage Range Selection

This power supply is provided AC voltage range selection switch (SW1). When SW1 is selected to AC120V, input is voltage-doubled by primary rectifier block, to produce a DC coarse-rectified voltage. And when SW1 is selected to AC220V, input is full wave rectified.

3.3.4 Overvoltage and Overcurrent Protection

Overvoltage and overcurrent protection is provided by the Q5 circuit in the monitor. This safety circuit is latched. The circuit cannot be reset until the power switch is in the "off" position. To reset the circuit, turn the power switch off, wait ten seconds, and turn the power switch back on.

3.4 DEFLECTION MODULE

The deflection circuit is composed of the horizontal scanning and high voltage power supply circuit, the vertical scanning circuit and the the blanking control circuit.

3.4.1 Horizontal Scanning and High Voltage Power Supply Circuit

In the horizontal and high voltage drive circuits, the drive transistor Q201 controls the horizontal scanning circuit current to the deflection yoke coil, sawtooth current, and drives the flyback transformer (FBT) T202 to supply high voltage of about 24kV to the CRT anode by stepping up the FBT during the retrace period. In case of abnormal increased high voltage due to a malfunction, the high voltage shut down circuit will operate and shut down the output of horizontal AFC IC200, shutting off the high voltage.

In the horizontal circuit, the side pincushion (SPC) transformer T201 modulates the horizontal scanning current by varying it's secondary inductance driven by a parabolic signal so that SPC distortion of the CRT will be compensated. Horizontal picture width is adjustable by width coils L201 and L1 on matching transformer module, and horizontal raster location is centered by H CENTER switch SW1, which is a preset adjustment.

3.4.2 Vertical Scanning Circuit

This circuit is operated by one chip, IC300, which contains the vertical oscillator and drive circuit. The vertical SYNC signal is synchronized by V HOLD VR300. Picture height is adjusted by HEIGHT VR VR302 which controls the vertical scanning current. Vertical raster location is adjusted by V CENTER VR VR301 which controls DC bias current for the vertical scanning current.

3.4.3 Blanking Control Circuit

Blanking control circuit biases the 1st grid voltage to low and cuts all R.G.B. beams off so that unnecessary raster on the horizontal and vertical retrace period disappears.

Brightness control circuit varies raster brightness by controlling 1st grid voltage with BRIGHTNESS VR.

3.5 MATCHING TRANSFORMER MODULE

The matching transformer is provided to adjust the high voltage and picture size according to user timing respectively, by changing the connector position JX and JY. (refer to Fig. 7-6)

3.6 VIDEO AMPLIFIER MODULE

3.6.1 Video Amplifier

The video amplifier module is composed of three amplifiers for red, green and blue channels, respectively and sync circuit.

The video input signal is fed to the video amplifier IC101 through the AC coupling capacitor. The emitter follower appears as a high input impedance.

3.6.1.1 Gain Control

Contrast is controlled by varying the bias voltage of pin 24 of IC101 by using the variable resistor CONTRAST VR and the full scale gain for each channel of the video amplifier is adjusted by VR105. Frequency compensation is achieved by VC101 varying the gain in the high frequency band.

Tracking of low contrast is adjusted by VR102 to obtain the proper white balance.

Transistor Q102 is the final stage of the video amplifier. It's output is fed to the CRT cathode through capacitor C117.

3.6.1.2 Bias Control

The DC restoration, which controls the brightness of the raster is controlled by transistor Q103 and Q105.

The white balance of high brightness is adjusted by variable resistor VR103. Tracking of low brightness is adjusted by variable resistor VR104.

3.6.2 Sync Circuit

3.6.2.1 Sync Signal Separator

When the sync selection switch is set to "H/V MIX" or "H/V separate", the signal detector IC400(1/2) receives the external H.V. SYNC signal directly.

When the sync selection switch is set to COMP, the signal detector IC400(1/2) receives a G composite signal. The bias is controlled at the best threshold point by IC400(2/2). The sync signal, H.V. SYNC, is then detected.

3.6.2.2 Sync Signal Processor

In this circuit, the H.V. SYNC signal is separated and these pulse widths are normalized by two monostable multivibrators.

H. SYNC width is adjusted by VR402 to control H phase. V. SYNC width determines the vertical blanking period. The DC restoration signal generator circuit is formed by two monostable multivibrators (IC402 1/2), (IC402 2/2) to produce a DC restoration signal (CLAMP-N).

One of them (IC402 2/2) generates a pulse in the horizontal back porch period from the rising edge of H. SYNC signal. When the sync signal is not applied, the other (IC402 1/2) detects such a condition and set a DC Restration Signal to an active level (Low) so that the black level is maintained.

3.7 FOCUS MODULE (FCS400)

In this module, CRT socket is mounted. Then, amplituded video signal and heater voltage and 1st, 2nd grid voltage are fed to CRT.

3.8 OPERATOR CONTROL PANEL

Operator control panel is composed of power ON/OFF switch, Degauss Switch and Brightness VR, and Contrast VR. Degauss switch is momentary type, then keep the switch depressed until the color distortion disappears. Brightness VR controls brightness of the raster. And contrast VR controls brightness of the picture.

4. ADJUSTMENT AND TEST

4.1 TEST EQUIPMENT AND TOOLS

The following test equipment and tools, are recommended to maintain the monitor:

a. Volt-Ohm-Ammeter:
   Simpson Model 260
b. High voltage Probe 30 kV:
   Simpson catalog No. 00509
c. Oscilloscope:
   SONY TEKTRONIX Type 475A
d. White balance adjuster:
   Minolta color analyzer II
e. TV signal generator:
   Vii 1208A, ASTRODESIGN VG807A
f. Magnifying glass (×10)
g. Degaussing Coil:
   G.C. Electronics catalog No. 9317
h. Hex Tuning Tool:
   G.C. Electronics catalog No. 8284
i. Alignment Screwdriver:
   G.C. Electronics catalog No. 5009

Contact your Local Hitachi Rep. for details about purchasing these tools.

CAUTION
Use a non-metallic tool to make all adjustments.

4.2 DEGAUSSING

Degaussing will be required when poor color purity appears on the screen. This monitor is equipped with a built-in automatic and manual degaussing.

However use of an external hand-held degaussing coil may be necessary for chassis, which may have been magnetized during transportation.

a. Build-up Degaussing
   The DEGAUSS function is automatically initiated when power is applied.
   By depressing the DEGAUSS switch, the monitor will be manually degaussed. Keep the switch depressed until the color distortion disappears. Manual degaussing is highly recommended after tilt and swivel operation.

b. External degaussing
   Turn on the hand-held degaussing coil at a distance of 3 feet (1 m) from the screen. Move it to within about 4 inches (10 cm) of the top and side of the screen. Make a slow circular movement a few times. Then move the coil gradually away from the screen and turn off the coil. Do not turn off the coil within 3 ft. (1 m) from the display.

4.3 BRIGHTNESS AND CONTRAST

BRIGHTNESS control increases or decreases brightness of the raster. CONTRAST control increases or decreases the contrast ratio of picture to raster luminance.

4.4 ADJUSTMENT

4.4.1 Synchronization Adjustment

The following are described for 64 KHz version, but the same procedure can be applied for 50 KHz version by changing module name.

Adjusting Potentiometer
V.HOLD : FDF410 VR300

Condition
Display pattern : Cross-Hatch

Adjustment Procedure
(1) Adjustment V.HOLD VR gradually so that pattern of cross-hatch becomes stable.

4.4.2 Adjustment of Horizontal Screen Location

Adjusting Potentiometers
H.CENTER : FDF410 SW1
H.PHASE : FVD411 VR402

Condition
Display pattern : Full Size Picture
Brightness : Max.

Adjustment Procedure
(1) If raster is not located center of the screen, select H.CENTER SW LEFT or RIGHT so that raster scan area moves to center.
(2) Adjust H.PHASE VR so that the center of the picture aligns with the center of the CRT screen.

4.4.3 Adjustment of Vertical Screen Location

Adjusting Potentiometer
V.CENTER : FDF410 VR301

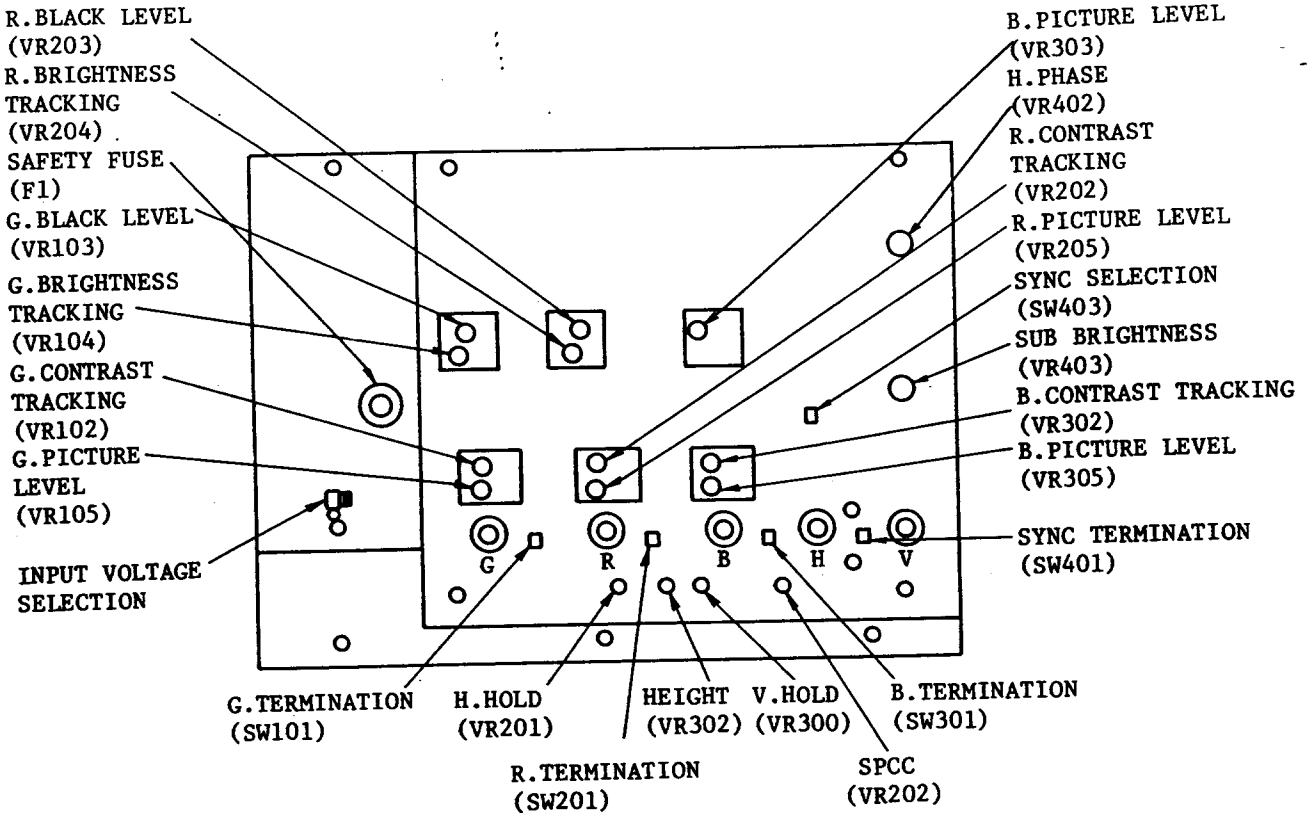
Condition
Display pattern : Full Size Picture

Adjumstment Procedure
(1) Adjust V.CENTER VR so that the picture center is aligned with the CRT screen center.

4.4.4 Adjustment of Picture Size

Adjusting Potentiometer
WIDTH : FDF410 L201, FPS412 L1
HEIGHT : FDF410 VR302

Condition
Display pattern : Full Size Cross-Hatch Pattern


R.BLACK LEVEL
(VR203)
R.BRIGHTNESS
TRACKING
(VR204)
SAFETY FUSE
(F1)
G.BLACK LEVEL
(VR103)
G.BRIGHTNESS
TRACKING
(VR104)
G.CONTRAST
TRACKING
(VR102)
G.PICTURE
LEVEL
(VR105)
INPUT VOLTAGE
SELECTION
B.PICTURE LEVEL
(VR303)
H.PHASE
(VR402)
R.CONTRAST
TRACKING
(VR202)
R.PICTURE LEVEL
(VR205)
SYNC SELECTION
(SW403)
SUB BRIGHTNESS
(VR403)
B.CONTRAST TRACKING
(VR302)
B.PICTURE LEVEL
(VR305)
SYNC TERMINATION
(SW401)
G
R
B
H
V
G.TERMINATION
(SW101)
H.HOLD
(VR201)
HEIGHT
(VR302)
V.HOLD
(VR300)
B.TERMINATION
(SW301)
R.TERMINATION
(SW201)
SPCC
(VR202)

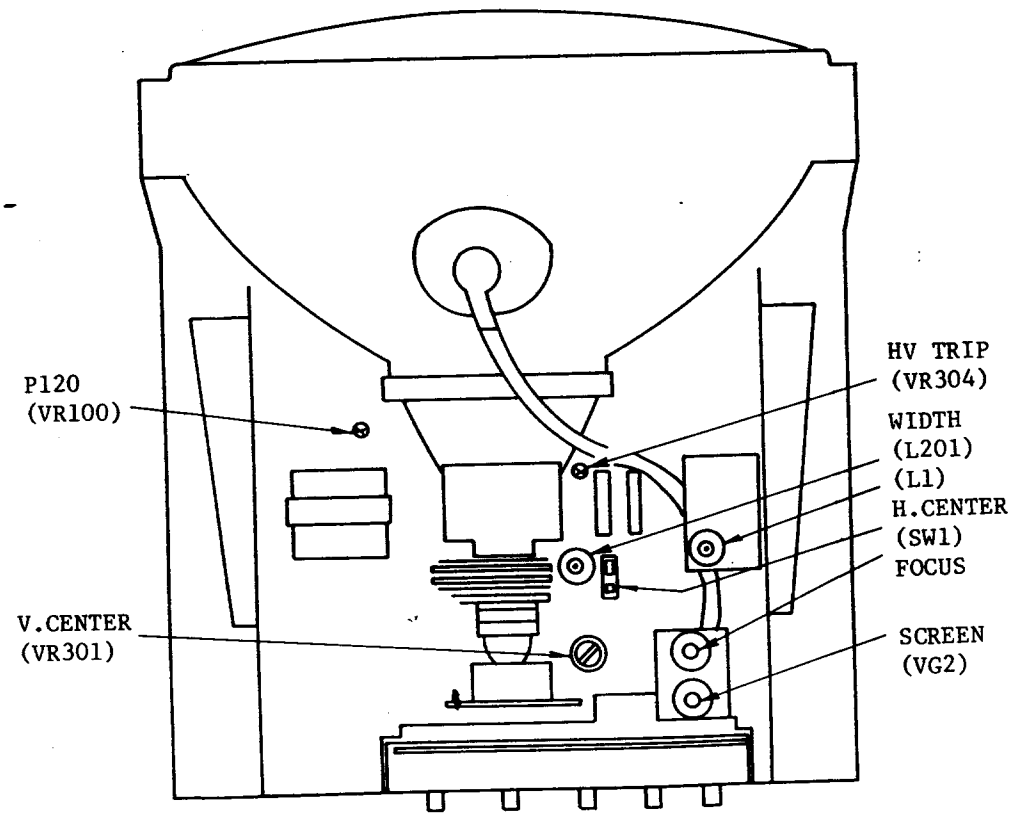

P120
(VR100)
V.CENTER
(VR301)
HV TRIP
(VR304)
WIDTH
(L201)
(L1)
H.CENTER
(SW1)
FOCUS
SCREEN
(VG2)

Fig. 4-1

Adjustment Procedure

(1) Adjust WIDTH COIL so that horizontal picture width may be 340 mm (for 64 KHz version) or 360 mm (for 50 KHz version).

(2) Adjust HEIGHT VR so that vertical picture height may be 270 mm.

4.4.5 Brightness and White Balance Adjustment

Adjusting Potentiometers and Switches

VG2	:	FDF410
SUB BRIGHTNESS	:	FVD410/411 VR403
R.G. BRIGHTNESS TRACKING	:	FVD410/411 VR104(G) VR204(R)
R.G.B. BLACK LEVEL	:	FVD410/411 VR103(G) VR203(R) VR303(B)
R.G.B. PICTURE LEVEL	:	FVD410/411 VR105(G) VR205(R) VR305(B)
R.G.B. CONTRAST TRACKING	:	FVD410/411 VR102(G) VR202(R) VR302(B)
BRIGHTNESS	:	OPERATOR CONTROL PANEL
CONTRAST	:	OPERATOR CONTROL PANEL

Condition

Display pattern	:	Full size white
Warm up time	:	20 Minutes min

Adjustment procedure

(1) Set R.G. BRIGHTNESS TRACKING VR, R.G.B. PICTURE LEVEL VR to min value, R.G.B. BLACK LEVEL VR and R.G.B. CONTRAST TRACKING VR, BRIGHTNESS VR, CONTRAST VR and SUB BRIGHTNESS VR to max value. Disconnect the video input signals in order to display back raster only.

(2) Adjust VG2 BIAS VR so that back raster may be displayed just before erased.

(3) Adjust R.G.B. BLACK LEVEL VR from max to min value so that raster may be white of less than 1 FtL. Connect the video input signals to display the picture.

(4) Adjust R.G.B. PICTURE LEVEL VR from min to max value so that picture may be white of about 25 FtL. If picture cannot be adjusted to 25 FtL, set CONTRAST VR to counter clockwise slightly, and readjust picture to about 25 FtL.

(5) Set BRIGHTNESS VR to min value. If picture is too dark to adjust, turn BRIGHTNESS VR to clockwise slightly. Then control R.G. BRIGHTNESS TRACKING VR from min to max value so that picture may be white.

(6) Set BRIGHTNESS VR to max value. Adjust SUB BRIGHTNESS VR from max to min so that raster may be just visible or appropriate luminance.

(7) Set CONTRAST VR to max value. Then adjust R.G.B. PICTURE LEVEL VR so that picture may be white of 25 FtL.

(8) Set CONTRAST VR to min value. Then adjust R.G.B. CONTRAST TRACKING VR from max to min value so that picture may be white of about 10 FtL.

4.4.6 Focusing

Control the FOCUS VR so that best focus may be obtained over the entire display area.

AC INPUT PANEL

No.	DESIGNATION		FUNCTIONAL DESCRIPTION	POLARITY (CCW) (CW) min max	POSITION	REMARKS
	DEVICE No.	SYMBOL NAME				
1	SW1	INPUT VOLTAGE SELECTION	AC input range selection	left right 200/ 100/ 240V 120V	rear	
2	F1	SAFETY FUSE			rear	

OPERATOR CONTROL PANEL

No.	DESIGNATION		FUNCTIONAL DESCRIPTION	POLARITY (CCW) (CW) min max	POSITION	REMARKS
	DEVICE No.	SYMBOL NAME				
1	VR2	BRIGHTNESS	Brightness (R.G.B. common black level) control	brighter	front	
2	VR1	CONTRAST	Contrast (R.G.B. common video gain) control	brighter	front	
3	SW1	POWER ON/OFF	Power ON/OFF control	1 : ON 0 : OFF	front	
4	SW2	DEGAUSS	Degauss activation to settle white uniformity	push: active	front	duration 10 sec. recovery 3 min.

POWER SUPPLY AND DEFLECTION BOARD (FDF410/411)

No.	DESIGNATION		FUNCTIONAL DESCRIPTION	POLARITY (CCW) (CW) min max	POSITION	REMARKS
	DEVICE No.	SYMBOL NAME				
1	VR100	P120	DC output voltage adjustment	higher voltage	top	should not be changed
2	VR201	H.HOLD	Horizontal frequency adjustment to hold stable picture		rear	should not be changed
3	VR300	V.HOLD	Vertical frequency adjustment to hold stable picture		rear	
4	VR301	V.CENTER	Vertical centering of raster scan area		rear	
5	VR302	HEIGHT	Raster height adjustment to get rated picture size		rear	
6	VR	FOCUS	Focus adjustment to get sharp image		top	
7	VR	VG2 (SCREEN)	Cut off voltage adjustment to set rated brightness	brighter	top	
8	SW1	H.CENTER	Horizontal centering of raster scan area	right side middle left side	top	
9	VR304	HV.TRIP	High voltage trip point adjustment to protect abnormal high voltage	higher	top	should not be changed
10	VR202	SPCC	Side pincushion adjustment to compensate the picture		rear	
11	L201	WIDTH	Raster width adjustment to get rated picture size		top	

Matching Transformer Board (FCS410/411)

1	L1	WIDTH	Raster width adjustment to get rated picture size		top	

VIDEO AMPLIFIER BOARD (FVD410/411/412/413)

No.	DESIGNATION		FUNCTIONAL DESCRIPTION	POLARITY (CCW) (CW) min max	POSITION	REMARKS
	DEVICE No.	SYMBOL NAME				
1	VR103	G. BLACK LEVEL	Black level (raster brightness adjustment at max.BRIGHTNESS setting	emphasize green	rear	
2	VR203	R. BLACK LEVEL		emphasize red	rear	
3	VR303	B. BLACK LEVEL		emphasize blue	rear	
4	VR104	G. BRIGHTNESS TRACKING	Color tracking compensation at min.BRIGHTNESS setting	emphasize green	rear	
5	VR204	R. BRIGHTNESS TRACKING		emphasize red	rear	
6	VR105	G. PICTURE LEVEL	Contrast (video signal gain) adjustment at max.CONTRAST setting	emphasize green	rear	
7	VR205	R. PICTURE LEVEL		emphasize red	rear	
8	VR305	B. PICTURE LEVEL		emphasize blue	rear	
9	VR102	G. CONTRAST TRACKING	Picture luminance color tracking compensation at min. CONTRAST setting	emphasize green	rear	
10	VR202	R. CONTRAST TRACKING		emphasize red	rear	
11	VR302	B. CONTRAST TRACKING		emphasize blue	rear	
12	VC101		Pulse responce (video band) compensation		rear	should not be changed
13	VC201				rear	
14	VC301				rear	
15	VR402	H. PHASE	Horizontal centering of active display area	shift to right side	rear	

No.	DESIGNATION		FUNCTIONAL DESCRIPTION	POLARITY (CCW) (CW) min max	POSITION	REMARKS
	DEVICE No.	SYMBOL NAME				
16	VR403	SUB BRIGHTNESS	Black level (rester brightness) at max BRIGHTNESS setting	emphasize black level	rear	
17	SW101	G. TERMINATION	Impedance selection of green input	up : 75 ohms down: HIGH	rear	
18	SW201	R. TERMINATION	Impedance selection of red input	up : 75 ohms down: HIGH	rear	
19	SW301	B. TERMINATION	Impedance selection of blue input	up : 75 ohms down: HIGH	rear	
20	SW401	SYNC TERMINATION	Impedance selection of sync input	up : 75 ohms down: HIGH	rear	
21	SW403	SYNC SELECTION	SYNC selection of COMPOSITE or H.V.MIXED SYNC or H.V.SEPARATE SYNC	up : COMP. center: MIXED down: SEPARATE	rear	

5. MAINTENANCE AND TROUBLESHOOTING

This chapter describes both preventive and corrective maintenance. Preventive maintenance is mainly concerned with monitor cleaning. Corrective maintenance deals with fault isolation. Before beginning maintenance work, always make sure that AC power is turned off. Maintenance personnel should refer to this chapter when performing maintenance procedures.

5.1 PREVENTIVE MAINTENANCE

Preventive maintenance consists of cleaning the inside of the chassis, cleaning the screen face and checking the cable connections. Environmental conditions will determine how often cleaning has to be done. Maintenance personnel are urged to refer to Section 2.1 "INSTALLATION PRECAUTIONS".

5.2 CORRECTIVE MAINTENANCE

Corrective maintenance consists of the trouble shooting as described in the following table and Section 4 "ADJUSTMENT AND TEST".

CAUTION

"Be careful of High Voltage".

5.3 TROUBLESHOOTING GUIDE

TROUBLE SHOOTING MAP

TROUBLE SHOOTING PROCEDURE

1 FIND THE SYMPTOM FROM THE LEFT COLUMN.

2 FOLLOW THE LINE END NOTE "○" AREAS WHERE PROBLEM COULD CAUSE SYMPTOMS.

3 USE THESE REMEDIES, EXECUTING THE ITEMS ON THE RIGHT SIDE OF THE PAGE FIRST.

ITEM	MONITOR INSTALLATION				PROTECTIONS AND MONITOR SETTINGS			INTERNAL MONITOR ADJUSTMENTS	MODULE DEFECTIVE			
POSSIBLE CAUSE / CORRECTIVE ACTION / PICTURE QUALITY SYMPTOMS	INCORRECT AC RANGE SETTING OR POWER SOURCE APPLY RATED AC INPUT	INCORRECT SIGNAL WIRING OR TERMINATION SWITCH POSITION SET TO CORRECT CONDITION	SIGNAL LEVEL OR TIMING MISMATCH APPLY RATED WAVEFORM	MAGNETIC FIELD FROM OTHER MONITORS OR OTHER SOURCES KEEP AWAY FROM MAGNETIC SOURCE	AC FUSE OPEN INSTALL RATED FUSE	OVER LOAD PROTECTION CAUSED BY NOISE TURN POWER SW OFF WAIT 1 MIN, THEN TURN ON	BRIGHTNESS CONTROL SET TO MINIMUM SET TO THE OPTIMUM RANGE	ADJUSTMENT IS INCORRECT REFER TO THE ADJUSTMENT DESCRIPTION LISTED AND READJUST	POWER SUPPLY AND DEFLECTION MODULE REPLACE THE MODULE	VIDEO AMP. MODULE	CRT SOCKET BOARD	CRT TUBE AND YOKE
PICTURE ROLLS OR NO SYNCHRONIZATION		○	○					V-HOLD VR-300	○	○		
PICTURE TOO NARROW			○					WIDTH COIL L201	○			
PICTURE TOO WIDE			○					WIDTH COIL L201	○			
PICTURE TOO SHORT			○					HEIGHT VR VR302	○			
PICTURE TOO TALL			○					HEIGHT VR VR302	○			
PICTURE NOT CENTERED ON SCREEN			○					H-CENTER SW SW1	○			
ditto			○					H-PHASE VR VR402	○			
ditto			○					V-CENTER VR VR301	○			
PICTURE TOO DARK	○	○	○				○		○	○	○	○
PICTURE TOO LIGHT	○	○	○				○		○	○	○	○
VERTICAL LINES NOT STRAIGHT				○				HEIGHT VR VR302	○			
VERTICAL LINE PITCH IS UNEQUAL				○				WIDTH COIL L201	○			
COLOR BALANCE IS INCORRECT			○					PERFORM WHITE BAL ADJ		○		
ONE OF 3 COLORS IS MISSING								" " " "		○	○	○
COLOR PURITY IS BAD			○	○			○	DEGAUSS WITH SW		○	○	○
FOCUS IS NOT SHARP	○		○				○	ADJ FOCUS POT	○	○	○	○
NO PICTURE-POWER LIGHT IS ON						○	○	ADJ BRIGHTNESS CONTROL	○	○		
OVERSHOOT OR SMEAR APPEARS		○	○							○		
PICTURE NOISE OPTICAL FLUCTUATION	○	○						PERFORM WHITE BALANCE		○		
NO POWER TO INDICATOR LIGHT	○				○	○			○			
SCREEN COLORS CHANGE WHEN		○	○	○				ADJ WHITE BALANCE	○	○	○	○
BRIGHTNESS IS CHANGED												
ARCING NOISE FROM CRT	○							ADJ HI VOLTAGE POT	○			○

6. HITACHI TECHNICAL SUPPORT

Thank you for using the HITACHI HM-4115 Color Monitor. The monitor is designed to provided you with many years of useful service. As with any equipment, Eventually your monitor may maintenance.

The following offices are equipped with technical personal to handle your technical needs:

USA

Hitachi America Ltd.
New Jersey Office
59 Route 17 South, Allendale, NJ 07401
Phone (201) 825-8000

Hayward Office
3540 Arden Road, Hayward, CA
Phone (415) 783-8400

JAPAN

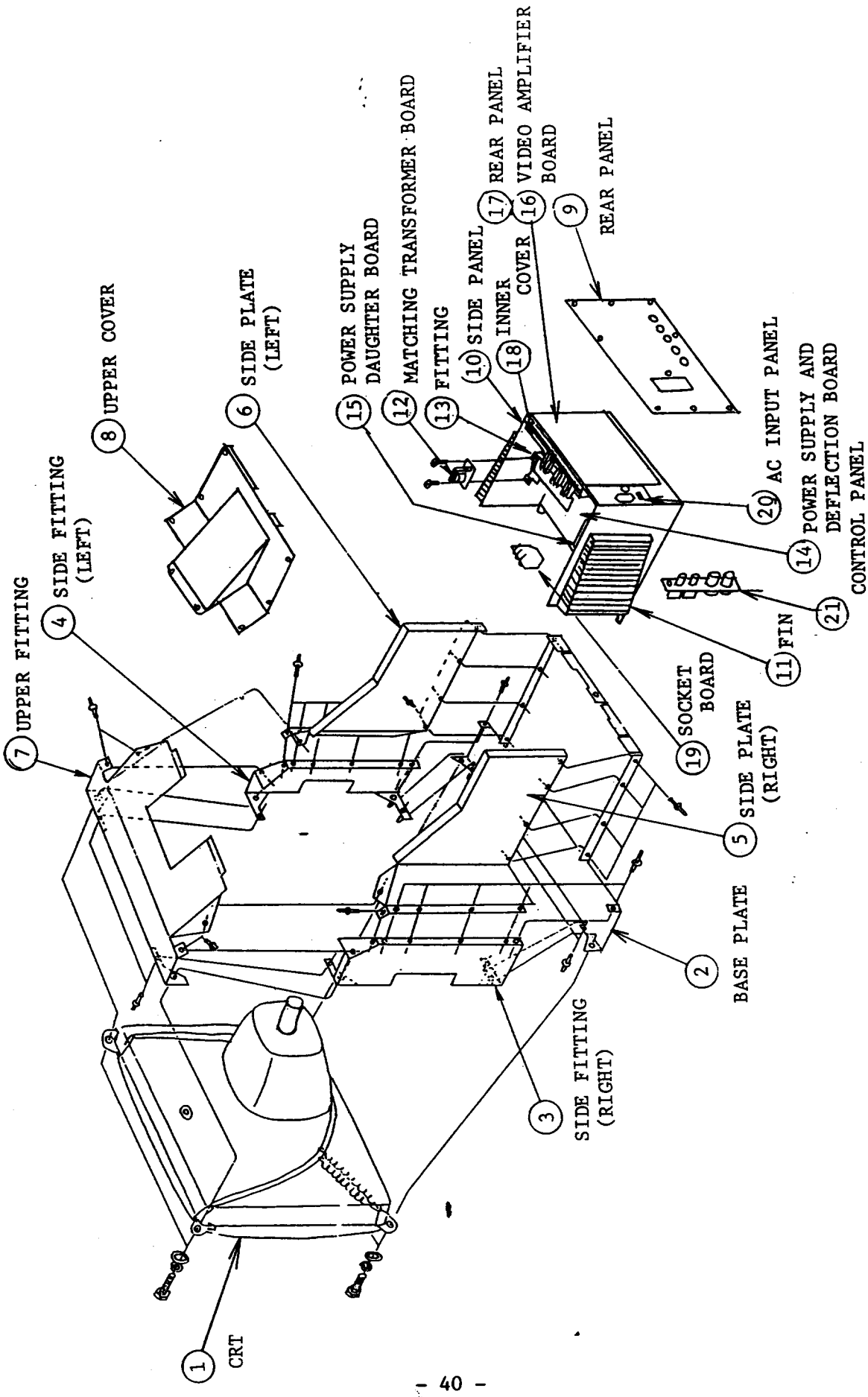
Hitachi, Ltd.
4-6, Kanda-Surugadai, Chiyoda-ku, Tokyo, Japan.
Phone (03) 258-2111

EUROPE

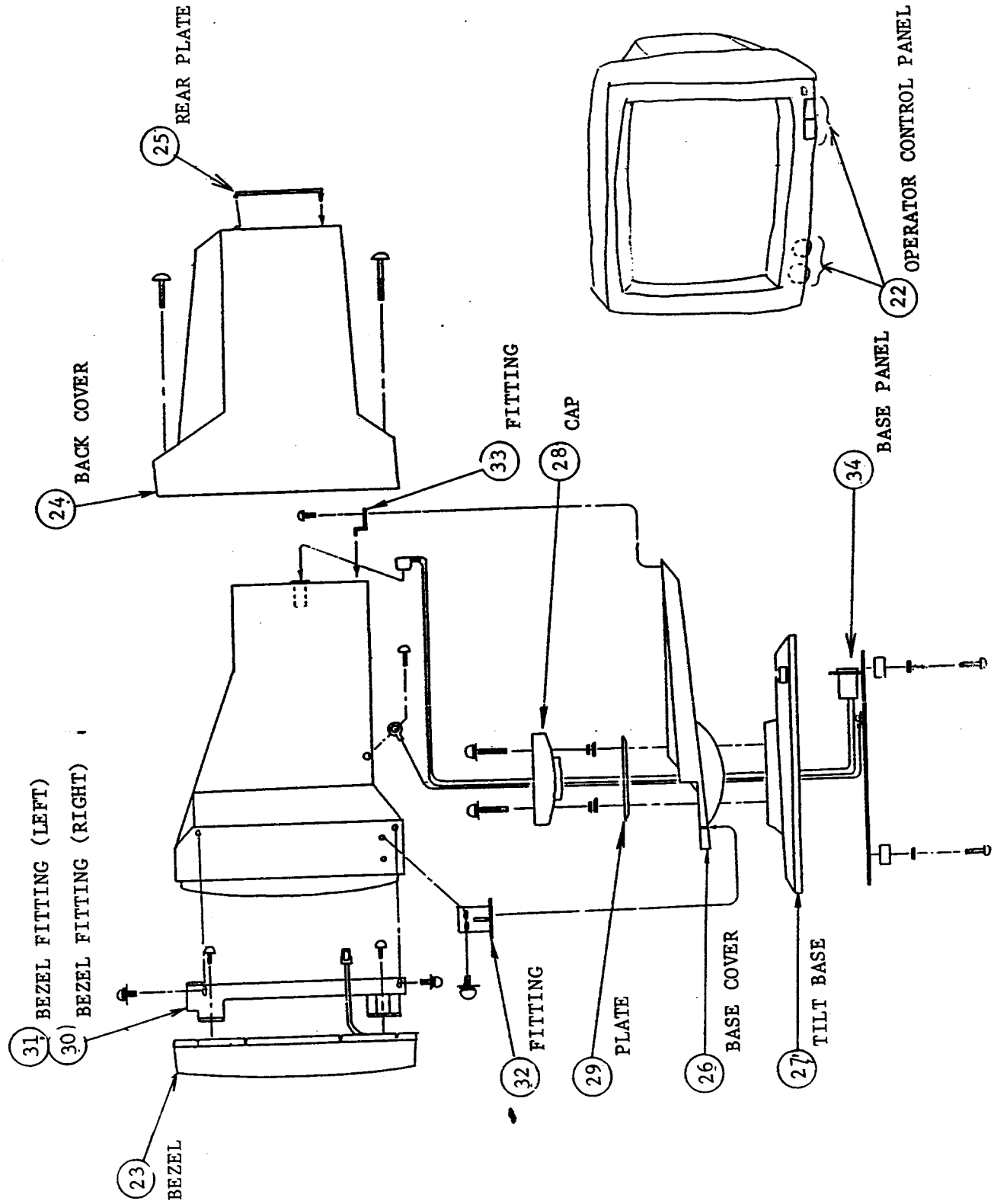
Hitachi Europe GmbH
Schwannsstrasse 3, 4000 Düsseldorf 30, West Germany.
Phone (0211) 49610

Hitachi Europe Ltd.
2nd Floor, Trafalgar House,
Hammersmith International Center,
2 Chalkhill Road, Hammersmith London, W6, United Kingdom.
Phone (01) 748-2001

APPENDIX I EXPLODED VIEWS OF PARTS (1/2)



EXPLODED VIEWS OF PARTS (2/2)



APPENDIX II PARTS LIST

REFERENTIAL DESIGNATION		DESCRIPTION	MODULE NUMBER	HITACHI PART NUMBER	Adaptable for
NO.	NAME				
1	CRT	A/R coating panel normal clear glass			HM-4119-*-A*-* HM-4119-*-C*-*
2	BASE PLATE		QA18716		HM-4119-*-**-*
3	SIDE FITTING (RIGHT)		QA18887		
4	SIDE FITTING (LEFT)		QA18887		
5	SIDE PLATE (RIGHT)		QA18717		
6	SIDE PLATE (LEFT)		QA18717		
7	UPPER FITTING		QA18718		
8	UPPER COVER		QA18688		
9	REAR PANEL		RA33663		HM-4119-D-**-* HM-4119-F-**-*
			RA33683		HM-4119-R-**-* HM-4119-B-**-*
10	SIDE PANEL		QA18876		HM-4119-*-**-*
11	FIN		RA32400		
12	MATCHING TRANSFORMER BOARD	H-frequency = 64KHz	FCS410 FUNC.A FUNC.B		HM-4119-*-*A-*
		H-frequency = 50KHz	FCS411 FUNC.L		HM-4119-*-*L-*
13	FITTING		SA95806		HM-4119-*-**-*
14	POWER SUPPLY AND DEFLECTION BOARD	H-frequency = 64KHz	FDF410 FUNC.A		HM-4119-*-*A-*
		H-frequency = 50KHz	FDF411 FUNC.L		HM-4119-*-*L-*
15	POWER SUPPLY DAUGHTER BOARD		FPS420		HM-4119-*-**-*
16	VIDEO AMPLIFIER BOARD	PIN JACK TYPE VIDEO Freq. = 100MHz VIDEO Freq. = 70MHz	FVD411 FUNC.A FVD413 FUNC.L		HM-4119-*-*A-* HM-4119-*-*L-*
		BNC CONNECTOR TYPE VIDEO Freq. = 100MHz VIDEO Freq. = 70MHz	FVD410 FUNC.B FVD412 FUNC.M		HM-4119-*-*A-* HM-4119-*-*L-*

REFERENTIAL DESIGNATION		DESCRIPTION	MODULE NUMBER	HITACHI PART NUMBER	Adaptable for
NO.	NAME				
17	REAR PANEL		RA33631		HM-4119-*-**-*
18	INNER COVER		RA33632		
19	SOCKET BOARD		FCS400		
20	AC INPUT PANEL		RA33674		
21	CONTROL PANEL		RA33679		HM-4119-B-**-*
22	OPERATOR CONTROL PANEL		FPS410		HM-4119-D-**-*
23	BEZEL		QA18689		
24	BACK COVER		QA18691		
25	REAR PLATE		RA33656		
26	BASE COVER		QA18690		
27	TILT BASE		QA18692		
28	CAP		SA92932		
29	PLATE				
30	BEZEL FITTING (RIGHT)		SA97490		
31	BEZEL FITTING (LEFT)		SA97490		
32	FITTING		TA66583		
33	FITTING		TA57407		
34	BASE PANEL		RA34633		

APPENDIX III COMPONENT PARTS LIST AND SCHEMATICS

1. Components marked with "*" have special characteristics important to safety. Before replacing any of these components, read carefully the PRODUCT SAFETY NOTICE. Don't degrade the safety of the color monitor through important servicing.

2. Components marked with "**" are sealed controls. If these components are necessary to replace, read carefully the REPLACEMENT OF THE SEALED CONTROLS.

3. The parts disignation and symbols used in PARTS LIST are defined as bellows.

SYMBOL

Q	TRANSISTOR
IC	INTEGRATED CIRCUIT
D	DIODE
ZD	ZENER DIODE
R	RESISTOR
C	CAPACITOR
VR	VARIABLE RESISTOR
VC	VARIABLE CAPACITOR
L	INDUCTOR
TR	TRANSFORMER
SW	SWITCH
RP	POSISTOR (RESISTOR)
TH	THERMISTOR (RESISTOR)
RY	RELAY

TYPE CLASSIFICATION

R	MX	METAL OXIDE FILM
	MF	METAL FILM
	CF	CARBON FILM
	FR	FUSE RESISTOR
C	AL	ALUMINUM
	CR	CERAMIC
	PE	POLYESTER
	PP	POLYPROPYLENE

TOLERANCE

G	±2%
J	±5%
K	±10%
M	±20%
Z	+80 ∿ -20%

Note : Resistance taper characteristic of all variable resistors is "B". And power rating is 0.15 W, except VR301 (FDF410).

IDENTIFICATION NO. 20 AC INPUT PANEL

PARTS NAME	PARTS NO.	DESCRIPTION
INLET FILTER LF1		GL-2030C2
FUSE HOLDER		FEU031-1673
FUSE HOLDER CAP.		FEK031-1661
FUSE F1		MGC3. 3A
VOLTAGE SELECTOR SWTICH SW1		SU110A11
CAPACITOR C150		CR 3300pF 400V
C151		CR 3300pF 400V
CONNECTOR AC1		MLR-06
P09		3P-SVF
P04		5P-SVF
RESISTOR R160		CF 680KΩ 1/2W

IDENTIFICATION NO. 22 OPERATOR CONTROL PANEL FPS410

PARTS NAME	PARTS NO.	DESCRIPTION
POTENTIOMETER BRIGHTNESS VR2		RK911 1KΩ 0.05W
CONTRAST VR1		"
LED LEDL		HLMP-1501
POWER ON/OFF SWITCH SW1		NE15-EE
DEGAUSS SWITCH SW2		NE15-0A
CONNECTORS AC1		MLP-06
S01		B10B-XH-A
S02		B3B-XH-A
S03		B3B-XH-A

IDENTIFICATION NO. 34 BASE PANEL (Cabinet type only)

PARTS NAME	PARTS NO.	DESCRIPTION
CONNECTOR G		31 KU 1500
R		31 KU 1500
B		31 KU 1500
H		31 KU 1500
V		31 KU 1500
AC INLET		PA 125

P.C.B. PARTS LIST IDENTIFICATION No.12 MATCHING TRANS. BOARD:FCS410/411(1/1)

SYMBOL No.	DESCRIPTION		
Resistor			
R1	MX	330 5W	J
Capacitor			
C1	CR	470P 2K	J
Inductor			
L1*	See the following table		
Transformer			
T1*	See the following table		
Connector			
DO2	TS-80P-4P-V1		
JX1	RTB-1.5-2		
JX2	RTB-1.5-2		
JX3	RTB-1.5-2		
JY1	RTB-1.5-3		
JY2	RTB-1.5-3		
JY3	RTB-1.5-3		

SYMBOL No.	DESCRIPTION

P.C.B. PARTS LIST IDENTIFICATION No.14 POWER SUPPLY AND DEFLECTION BOARD:FDF410/411(1/7)

SYMBOL No.	DESCRIPTION
IC	
IC100	HA17805P
IC101*	HA178M24P
IC200*	HA11235
IC201*	NJM2902N
IC300	TDA1670A
Transistor	
Q100	2SK534
Q101	See the following table
Q200	2SK216
Q201*	2SC3688
Q202*	2SA1011E
Q203*	See the following table
Q204*	2SD1113K
Q205	2SC2901
Q206*	2SC3688
Q300	2SC1921
Q301	2SA1207R
Q302	2SC2545E
Diode	
D100	RB406
D101	GU-3A
D102	1S2076A
D103	1S2076A
D110	GFB30G
D111	5GG2C41
D112	U19C
D113	U19C

SYMBOL No.	DESCRIPTION
D115	V09G
D117	V09G
D201	V09G
D202	V09G
D204*	CTU-G3DR
D206	1S2076A
D207*	See the following table
D208*	V09G
D209*	RH4F
D211	1S2076A
D212*	1SS83
D213	V09G
D214*	1S2076A
D220	1S2076A
D221	V09G
D222*	1S2076A
D300	1S2076A
D301	V09G
D302	1SS83
D303	1SS83
D306	1S2076A
D307	1SS83
Zenor diode	
ZD100	HZ12HC2
ZD101	See the following table
ZD110	HZ20H-2
ZD111	HZ24H2

SYMBOL NO.	MODULE TYPE	
	FDF410	FDF411
Q101	2SK534	none
Q203	2SC3481	2SD1455
D207	1S2076A	A-35
ZD101	HZ12HB-2	HZ4HB-2

P.C.B. PARTS LIST IDENTIFICATION No.14 POWER SUPPLY AND DEFLECTION BOARD:FDF410/411(2/7)

SYMBOL No.	DESCRIPTION			
ZD200*		HZ9LB-2		
ZD300		HZ18L-1		
ZD301		HZ9LB-2		
ZD310		HZ15H-3		
Resistor				
R100	CF	470K	1/2W	J
R101	See the following table			
R102	MX	51K	2W	J
R103	See the following table			
R104	MF	0.47	3W	J
R105	CF	470K	1/2W	J
R109	See the following table			
R110	CF	100	1/4W	J
R111	MX	10K	1/2W	J
R112	CF	1K	1/4W	J
R113	CF	1K	1/4W	J
R114*	CF	82K	1/2W	G
R115	CF	680K	1/2W	J
R116	CF	100	1/4W	J
R117	CF	470	1/4W	J
R118	MX	27	1W	J
R119	CF	1K	1/4W	J
R120	CF	330	1/2W	J
R130	CF	100	1/4W	J
R150	MX	15K	20W	J

SYMBOL No.	DESCRIPTION			
R200	MX	1.8K	5W	J
R201	MX	1.8K	5W	J
R204	MF	3	5W	J
R205*	CF	20K	1/4W	J
R206*	CF	20K	1/4W	J
R207*	See the following table			
R208	See the following table			
R209	MX	470	2W	J
R211	MF	3	5W	J
R212	CF	1K	1/4W	J
R214	CF	1K	1/4W	J
R215	CF	15K	1/2W	J
R216	CF	4.7K	1/4W	J
R217*	See the following table			
R218*	See the following table			
R219*	CF	10K	1/4W	J
R220	CF	2.2K	1/4W	J
R222	CF	1K	1/4W	J
R223	CF	1K	1/4W	J
R224*	MX	680	1W	J
R228*	CF	5.1K	1/4W	J
R229*	CF	3.3K	1/4W	J

SYMBOL NO.	MODULE TYPE							
	FDF410				FDF411			
R101	MX	500	10W	J	MX	510	5W	J
R103	MF	1.5	1W	J	MF	5.6	1/2W	J
R109	MX	20	1/2W	J	MX	150	1/2W	J
R207	CF	15K	1/4W	J	CF	12K	1/2W	J
R208	CF	6.8K	1/4W	J	CF	10K	1/4W	J
R217	CF	62K	1/4W	J	CF	33K	1/4W	J
R218	CF	15K	1/4W	J	CF	8.2K	1/4W	J

P.C.B. PARTS LIST IDENTIFICATION No.14

POWER SUPPLY AND DEFLECTION BOARD:FDF410/411(3/7)

SYMBOL No.	DESCRIPTION			
R233	CF	1K	1/2W	J
R234	CF	390	1/4W	J
R235	CF	6.8K	1/4W	J
R236*	CF	10K	1/4W	J
R237*	CF	3.3K	1/4W	J
R238*	CF	75	1/2W	J
R239*	CF	20K	1/4W	J
R243*	CF	15K	1/4W	J
R245*	CF	20K	1/4W	J
R246	CF	2.2	1/4W	J
R250	MX	470	2W	J
R252	MX	33	2W	J
R256	See the following table			
R257	See the following table			
R258*	MX	22K	2W	J
R260*	See the following table			
R261	MX	5.6	1W	J

SYMBOL No.	DESCRIPTION			
R300	CF	4.7K	1/4W	J
R301	CF	2.7K	1/4W	J
R302	CF	3.3K	1/4W	J
R303	CF	6.8K	1/4W	J
R304	CF	100K	1/4W	J
R305	CF	3	1/4W	J
R306	CF	150K	1/4W	J
R307	CF	1.8M	1/4W	J
R308	CF	150K	1/4W	J
R309	CF	1K	1/4W	J
R310	CF	2K	1/4W	J
R311	CF	47K	1/4W	J
R313	CF	120	1/4W	J
R314	MX	220	2W	J
R315	MX	470	2W	J
R316	MF	1	2W	J
R317	MX	100	2W	J
R318	CF	47K	1/2W	J
R319	CF	470K	1/4W	J
R320	CF	82K	1/2W	G
R321	CF	120K	1/4W	J
R322	CF	4.7K	1/4W	J
R323	CF	12K	1/4W	G
R324*	CF	6.2K	1/4W	G
R326*	MX	47K	1W	G
R327*	CF	22K	1/4W	G
R328	CF	150K	1/4W	J
R329	CF	2.7K	1/4W	J
R330	CF	5.6K	1/4W	J
R331*	CF	10K	1/4W	G

SYMBOL NO.	MODULE TYPE					
	FDF410			FDF411		
R256	MF	5.6 1W	J	MX	10 1W	J
R257	MF	5.6 1W	J	MX	10 1W	J
R260	CF	10K 1/4W	J	CF	8.2K 1/4W	J

P.C.B. PARTS LIST IDENTIFICATION No.14 POWER SUPPLY AND DEFLECTION BOARD: FDF410/411(4/7)

SYMBOL No.	DESCRIPTION		
R332	MX	3.3K 2W	J
R333	MX	680 1W	J
R334	CF	2.7K 1/4W	J
R335	CF	4.7K 1/4W	J
R336	CF	6.8K 1/4W	J
R339*	CF	5.1K 1/4W	J
R350	CF	100 1/4W	J
R351	CF	4.7K 1/4W	J

SYMBOL No.	DESCRIPTION		
Capacitor			
C100	PE	1μ 250V	K
C101	CR	3300P 400V	M
C102	CR	3300P 400V	M
C103	AL	680μ 250V	M
C104	AL	680μ 250V	M
C105	PP	0.047μ 630V	K
C106	CR	220P 2KV	K
C115	CR	1500P 400V	
C117	PP	0.047μ 200V	K
C118	AL	470μ 100V	M
C119	AL	470μ 160V	M
C120	AL	1000μ 16V	M
C121	AL	2200μ 50V	M
C122	PE	0.22μ 50V	K
C124	AL	220μ 16V	M
C126	PE	0.22μ 50V	K
C127	AL	2200μ 35V	M
C129	AL	47μ 160V	M
C130	AL	47μ 100V	M

P.C.B. PARTS LIST IDENTIFICATION No.14

POWER SUPPLY AND DEFLECTION BOARD: FDF410/411(5/7)

SYMBOL No.	DESCRIPTION			
C200	AL	47μ	160V	M
C201	PP	0.1μ	220V	K
C204*	PP	2700P	1.6KV	J
C205*	See the following table			
C206	CR	0.01μ	50V	K
C207	AL	47μ	160V	M
C209*	See the following table			
C211*	PP	0.056μ	200V	J
C213	CR	0.01μ		Z
C214	PE	0.015μ	50V	K
C215	CR	0.1μ	50V	Z
C216	PE	0.015μ	50V	K
C217	AL	47μ	35V	M
C218	AL	1μ	50V	M
C219	CR	1500P	50V	K
C220*	See the following table			
C224	AL	33μ	16V	M
C225	AL	47μ	35V	M
C226	CR	0.01μ	50V	Z
C227	AL	3.3μ	50V	M
C228	AL	1μ	50V	M
C229	See the following table			
C230	See the following table			
C231	AL	100μ	35V	M

SYMBOL No.	DESCRIPTION			
C233	AL	0.47μ	50V	M
C234	AL	4.7μ	160V	M
C235	AL	220μ	16V	M
C236	AL	10μ	35V	M
C240	CR	470PF	500V	J
C300	PP	0.22μ	50V	K
C301	AL	220μ	35V	M
C302	PP	0.1μ	50V	K
C303	PP	0.1μ	50V	K
C304	AL	220μ	35V	M
C306	PE	0.22μ	50V	K
C307	AL	47μ	35V	M
C308	AL	2200μ	25V	M
C309	AL	1μ	250V	M
C313	AL	10μ	35V	M
C316	CR	0.047μ	50V	Z
C318	CR	0.1μ	50V	Z
C319	AL	1μ	250V	M
C350	AL	10μ	35V	
C360	CR	0.1μ	50V	Z

SYMBOL NO.	MODULE TYPE					
	FDF410			FDF411		
C205	PP	2700P 1.6KV	J	PP	3300P 1.6KV	J
C209	PP	2200P 1.6KV	J	PP	1800P 1.6KV	J
C220	PP	1000P 50V	J	PP	2200P 50V	J
C229	PP	0.15μ 400V	J	PP	0.22μ 400V	J
C230	PP	0.15μ 400V	J	PP	0.22μ 400V	J

P.C.B. PARTS LIST IDENTIFICATION No.14

POWER SUPPLY AND DEFLECTION BOARD:FDF410/411(6/7)

SYMBOL No.	DESCRIPTION
Variable Resistor	
VR100***	RHAOC 100KΩ
VR201***	See the following table
VR202	RHAOQ 2.2KΩ
VR300	RHAOQ 4.7KΩ
VR301	WR188K 1KΩ 2W
VR302	RHAOQ 100KΩ
VR304***	RHAOC 2.2KΩ
Transformer	
T100	See the following table
T200	167201
T201*	H04624
T202*	See the following table
Inductor	
L100	SC-05-800D
L110	LAL04T6R8K
L111	SBC07
L112	SBC07
L201*	See the following table
L202*	H04109-3
L203	L4P31277
L204	See the following table

SYMBOL No.	DESCRIPTION
L301	LAL04T6R8K
FR	
FR100	FR 10 5W
RP	
RP100	ERPF5B0N180G
RP200*	ERPF3A4M402
Relay	
RY100	G2R117P-V-US
BMC Bead	
L102	B-20L-48B
L103	B-20L-48B
L104	B-20L-48B
L105	B-20L-48B
L106	See the following table
L107	B-20L-48B
Switch	
SW1	AAE40P023455

SYMBOL NO.	64K MODULE TYPE 50K	
	FDF410	FDF411
VR201	RHAOQ 2.2KΩ	RHAOQ 3.3K
T100	166202	166201-1
T202	MSU1CPW02	MSU1CPW04
L201	HO-4608-2	HO-4608-4
L204	SBC05-5	HO-4606-1
L106	B-20L-48B	none

P.C.B. PARTS LIST IDENTIFICATION No.14 POWER SUPPLY AND DEFLECTION BOARD:FDF410/411(7/7)

SYMBOL No.	DESCRIPTION
Connector	
D01	B4B-XH-A
D03	TS-80P-3P-V1
D04	TS-80P-4P-V1
P04	RTB-1.5-5
P05	RTB-1.5-2
P07	B10B-XH-A
P08	B12B-XH-A
P09	RTB-1.5-3

SYMBOL No.	DESCRIPTION

POWER SUPPLY

P.C.B. PARTS LIST IDENTIFICATION No.15 DAUGHTER BOARD: FPS420 (1/2)

SYMBOL No.	DESCRIPTION
IC	
IC1	ICM7556IPD
IC2	HA17901P
CI3*	μA723HC
Transistor	
Q1	2SC2545E
Q2	2SC2545E
Q3	2SC2545E
Q4	2SA1083E
Q5	2SC2545E
Q6	2SC2545E
Q7	2SA1083E
Diode	
D1	1S2076A
D2	1S2076A
D3	1S2076A
D4	1S2076A
D5	1S2076A
D6	1S2076A
D7	1S2076A
D8	1S2076A
D9	1S2076A
Zenor diode	
ZD1	HZ3LLB
ZD2	HZ6LC-2
ZD3	HZ9LB-2
ZD10	HZ9LB-2

SYMBOL No.	DESCRIPTION		
Resistor			
R1	CF	5.1K 1/4W	J
R2	CF	20K 1/4W	J
R3	CF	15K 1/4W	J
R5	CF	33K 1/4W	J
R6	CF	30K 1/4W	J
R7	CF	62K 1/4W	J
R8	CF	100 1/4W	J
R9	CF	100K 1/4W	J
R10	CF	2K 1/4W	J
R11	CF	2K 1/4W	J
R12	CF	200K 1/4W	J
R13	CF	10K 1/4W	J
R14	CF	150 1/4W	J
R15	CF	15K 1/4W	J
R16	CF	120K 1/4W	J
R17	CF	27K 1/4W	J
R18	MX	510 1/2W	J
R19	CF	390 1/4W	J
R20	CF	2K 1/4W	J
R21	CF	1K 1/4W	J
R22	CF	5.1K 1/4W	J
R23	CF	5.1K 1/4W	J
R24	CF	5.1K 1/4W	J
R25	CF	5.1K 1/4W	J
R26	CF	10K 1/4W	J
R31*	CF	3.9K 1/4W	J
R32	CF	1K 1/4W	J

POWER SUPPLY

P.C.B. PARTS LIST IDENTIFICATION No.15 DAUGHTER BOARD: FPS420 (2/2)

SYMBOL No.	DESCRIPTION			
R33*	CF	7.5K	1/4W	J
R34*	CF	10K	1/4W	J
R35	CF	30K	1/4W	J
R36	CF	1K	1/4W	J
R50	CF	1K	1/4W	J
C1	CR	47P	50V	K
C2	CR	470P	50V	K
C3	CR	30P	50V	K
C4	CR	0.1μ	50V	Z
C5	CR	220P	50V	K
C6	AL	47μ	25V	M
C7	AL	47μ	35V	M
C8	CR	0.01μ	50V	Z
C9	PE	0.022μ	50V	K
C10	CR	1000P	50V	K
C11	AL	220μ	35V	M
C12	CR	0.1μ	50V	Z
C13	PE	0.1μ	50V	K
C14	CR	0.1μ	50V	Z
C15	CR	0.1μ	50V	Z
C21	PE	0.01μ	50V	Z
C22	AL	22μ	25V	M

SYMBOL No.	DESCRIPTION
PC	
PHC1	PC511
TH	
TH1	ERTD2ZGL601S
Connector	
P01	MB-7P-90H
P03	MB-7P-90H

P.C.B. PARTS LIST IDENTIFICATION No.19 SOCKET BOARD: FCS400 (1/1)

SYMBOL No.	DESCRIPTION			
Diode				
D1	V09G			
Resistors				
R1	MX	100	1/2W	K
R2	CF	100K	1/2W	J
Capacitors				
C1	CR	2200PF	2KV	K
C2	CR	100PF	500V	K
C3	CR	470PF	50V	K
SOCKET				
SK1	S-B0895			
Neon Tubes				
NE1	SGA-5-C			
NE2	SGA-5-C			
NE3	SGA-5-C			
Connectors				
FOCUS	LPF-01T-2.5C			
C01	B3B-XH-A			
C02	B3B-XH-A			
C03	B3B-XH-A			
C04	B4B-XH-A			
C05	RTB-1.5-2F			
C06	P-97			

SYMBOL No.	DESCRIPTION

P.C.B. PARTS LIST IDENTIFICATION No.16 VIDEO AMP. BOARD: FVD410~413(1/6)

SYMBOL No.	DESCRIPTION
IC	
IC101	HA11505
IC201	HA11505
IC301	HA11505
IC400	LM319N
IC401	SN7428N
IC402	HD74LS123P
IC404	HD74LS123P
Transistor	
Q102	2SK619
Q103	2SA1207R
Q105	2SC1921
Q202	2SK619
Q203	2SA1207R
Q205	2SC1921
Q302	2SK619
Q303	2SA1207R
Q305	2SC1921
Diode	
D101	1SS83
D102	1SS83
D103	1SS83
D104	1SS83
D105	ISS83
D201	1SS83
D202	1SS83
D203	1SS83
D204	1SS83
D205	1SS83
D301	1SS83
D302	1SS83
D303	1SS83

SYMBOL No.	DESCRIPTION
D304	1SS83
D305	1SS83
D401	1S2076A
D402	1S2076A
D403	1S2076A
D404	1S2076A
D405	1S2076A
D406	V09G
D407	V09G
D410	1S2076A

P.C.B. PARTS LIST IDENTIFICATION No.16 VIDEO AMP. BOARD: FVD410~413 (2/6)

SYMBOL No.	DESCRIPTION			
Resistor				
R101	MX	75	1W	G
R102	note 1			
R106	note 1			
R107	note 1			
R109	CF	330	1/4W	J
R112	note 1			
R113	CF	5.6K	1/4W	J
R114	CF	2.2K	1/4W	J
R116	note 1			
R117	note 1			
R118	CF	150	1/4W	J
R120	CF	47K	1/4W	J
R121	note 1			
R122	note 1			
R123	note 1			
R124	note 1			
R125	note 1			
R126	CF	68	1/2W	J
R127	CF	220	1/4W	J
R130	CF	330K	1/4W	J
R131	CF	33K	1/4W	J
R134	CF	390	1/4W	J
R136		6.8K	1W	J
R137	CF	220	1/4W	J
R138	CF	470	1/4W	J
R139	CF	510	1/4W	J
R160	note 1			

SYMBOL No.	DESCRIPTION			
R201	MX	75	1W	G
R202	note 1			
R206	note 1			
R207	note 1			
R209	CF	330	1/4W	J
R212	note 1			
R213	CF	5.6K	1/4W	J
R214	CF	2.2K	1/4W	J
R216	note 1			
R217	note 1			
R218	CF	150	1/4W	J
R220	CF	47K	1/4W	J
R221	note 1			
R222	note 1			
R223	note 1			
R224	note 1			
R225	note 1			
R226	CF	68	1/2W	J
R227	CF	220	1/4W	J
R230	CF	330K	1/4W	J
R231	CF	33K	1/4W	J
R234	CF	390	1/4W	J
R236	MX	6.8K	1W	J
R237	CF	220	1/4W	J
R238	CF	470	1/4W	J
R239	CF	510	1/4W	J
R260	note 1			

note 1 See the table on page 62.

P.C.B. PARTS LIST IDENTIFICATION No.16 VIDEO AMP. BOARD: FVD410~413(3/6)

SYMBOL No.	DESCRIPTION			
R301	MX	75	1W	G
R302	note 1			
R306	note 1			
R307	note 1			
R309	CF	330	1/4W	J
R312	note 1			
R313	CF	5.6K	1/4W	J
R314	CF	2.2K	1/4W	J
R316	note 1			
R317	note 1			
R318	CF	150	1/4W	J
R320	CF	47K	1/4W	J
R321	note 1			
R322	note 1			
R323	note 1			
R324	note 1			
R325	note 1			
R326	CF	68	1/2W	J
R327	CF	220	1/4W	J
R330	CF	330K	1/4W	J
R331	CF	33K	1/4W	J
R333	CF	2K	1/4W	J
R336	MX	6.8K	1W	J
R337	CF	220	1/4W	J
R338	CF	470	1/4W	J
R339	CF	510	1/4W	J
R360	note 1			

SYMBOL No.	DESCRIPTION			
R400	CF	2.2K	1/4W	J
R401	CF	3.3K	1/4W	J
R402	CF	120	1/4W	J
R404	CF	2.2K	1/4W	J
R405	CF	220	1/4W	J
R406	CF	47K	1/4W	J
R407	CF	47K	1/4W	J
R409	CF	1K	1/4W	J
R410	MX	75	1W	G
R411	MX	75	1W	G
R414	CF	4.7K	1/4W	J
R420	CF	68K	1/4W	J
R421	CF	5.1K	1/4W	J
R424	CF	39K	1/4W	J
R425	CF	1K	1/4W	J
R429	CF	1K	1/4W	J
R436	CF	6.8K	1/4W	J
R437	CF	330K	1/4W	J
R438	CF	100	1/4W	J

note 1 See the table on page 62.

P.C.B. PARTS LIST II

SYMBOL No.	
R301	MX
R302	
R306	
R307	
R309	CF
R312	
R313	CF
R314	CF
R316	
R317	
R318	CF
R320	C
R321	
R322	
R323	
R324	
R325	
R326	C
R327	C
R330	C
R331	C
R333	C
R336	M
R337	C
R338	C
R339	C
R360	

note 1 See the t

P.C.B. PARTS LIST IDENTIFICATION No.16 VIDEO AMP. BOARD: FVD410~413 (4/6)

SYMBOL No.	DESCRIPTION			
Capacitor				
C101	AL	33μ	16V	M
C104	CR	0.1μ	50V	Z
C105	PE	3900P	50V	K
C108	CR	0.1μ	50V	Z
C109	CR	0.1μ	50V	Z
C110	CR	0.1μ	50V	Z
C111	CR	0.1μ	50V	Z
C115	PE	6800P	100V	K
C116	AL	47μ	100V	M
C117	AL	1μ	160V	M
C119	AL	33μ	16V	M
C120	CR	0.1μ	50V	Z
C124	CR	0.1μ	50V	Z
C125	CR	5P	50V	J
C201	AL	33μ	16V	M
C204	CR	0.1μ	50V	Z
C205	PE	3900P	50V	K
C208	CR	0.1μ	50V	Z
C209	CR	0.1μ	50V	Z
C210	CR	0.1μ	50V	Z
C211	CR	0.1μ	50V	Z
C215	PE	6800P	100V	K
C216	AL	47μ	100V	M
C217	AL	1μ	160V	M
C219	AL	33μ	16V	M
C220	CR	0.1μ	50V	Z
C224	CR	0.1μ	50V	Z
C225	CR	5P	50V	J

SYMBOL No.	DESCRIPTION			
C301	AL	33μ	16V	M
C304	CR	0.1μ	50V	Z
C305	PE	3900P	50V	K
C308	CR	0.1μ	50V	Z
C309	CR	0.1μ	50V	Z
C310	CR	0.1μ	50V	Z
C311	CR	0.1μ	50V	Z
C315	PE	6800P	100V	K
C316	AL	47μ	100V	M
C317	AL	1μ	160V	M
C319	AL	33μ	16V	M
C320	CR	0.1μ	50V	Z
C324	CR	0.1μ	50V	Z
C325	CR	5P	50V	J
C400	AL	1μ	50V	M
C402	PE	0.033μ	50V	K
C403	PE	0.01μ	50V	K
C404	CR	330P	50V	K
C407	CR	0.1μ	50V	Z
C408	CR	0.1μ	50V	Z
C409	AL	4.7μ	200V	M
C410	AL	47μ	100V	M
C411	CR	0.1μ	50V	Z
C413	CR	270P	50V	J
C414	PE	0.022μ	50V	K
C415	PE	0.033μ	50V	K
C416	CR	0.1μ	50V	Z
C417	CR	0.1μ	50V	Z
C418	CR	0.1μ	50V	Z
C419	AL	33μ	16V	M

P.C.B. PARTS LIST IDENTIFICATION No.16 VIDEO AMP. BOARD: FVD410~413(5/6)

SYMBOL No.	DESCRIPTION	
C420	CR 0.1μ 50V	Z
C421	AL 4.7μ 200V	M
C422	AL 4.7μ 100V	M
C423	AL 33μ 16V	M
Variable Resistor		
VR102	RHA0C 1K	
VR202	RHA0C 1K	
VR302	RHA0C 1K	
VR103	RHA0C 330	
VR104	RHA0C 4.7K	
VR105	RHA0C 470	
VR203	RHA0C 330	
VR204	RHA0C 4.7K	
VR205	RHA0C 470	
VR303	RHA0C 330	
VR305	RHA0C 470	
VR402	RHA0C 47K	
VR403	RHA0C 470	
Variable Capacitor		
VC101	TZ03T110E	
VC201	TZ03T110E	
VC301	TZ03T110E	
CP		
CP101	#226	
CP201	#226	
CP301	#226	

SYMBOL No.	DESCRIPTION
Inductor	
L101	note 1
L102	note 1
L103	LAL04T1R5M
L104	LAL04T330K
L201	note 1
L202	note 1
L203	LAL04T1R5M
L204	LAL04T330K
L301	note 1
L302	note 1
L303	LAL04T1R5M
L304	LAL04T330K
Switch	
SW101	AKZ00220858
SW201	AKZ00220858
SW301	AKZ00220858
SW401	AKZ00220858
SW403	AAA00230909
Connector	
FVD410	
VI1	BR-DV5-2
VI2	BR-DV5-2
VI3	BR-DV5-2
VI4	BR-DV5-2
VI5	BR-DV5-2
FVD411	
VI1	9815
VI2	9815
VI3	9815
VI4	9815
VI5	9815

note 1 See the table on page 62.

P.C.B. PARTS LIST IDENTIFICATION No.16 VIDEO AMP. BOARD: FVD410~13(6/6))

SYMBOL No.	DESCRIPTION
V01	B3B-HX-A
V02	B3B-HX-A
V03	B3B-HX-A
V04	S12B-XH-A

SYMBOL No.	DESCRIPTION

SYMBOL NO.	FVD410/411			FVD412/413		
R102,R202,R302	CF	68 1/4W	J	CF	120 1/4W	J
R106,R206,R306	CF	270 1/4W	J	CF	330 1/4W	J
R107,R207,R307	CF	180 1/4W	J	CF	220 1/4W	J
R112,R212,R312	CF	180 1/4W	J	CF	270 1/4W	J
R116,R216,R316	CF	12 1/4W	J	CF	10 1/4W	J
R117,R217,R317	CF	12 1/4W	J	CF	10 1/4W	J
R121,R221,R321	MX	330 5W	J	MX	390 5W	J
R122,R222,R322	MX	75 5W	J	MX	100 5W	J
R123,R223,R323	CF	51K 1/4W	J	CF	47K 1/4W	J
R124,R224,R324	CF	2K 1/4W	J	CF	2.2K 1/4W	J
R125,R225,R325	CF	22 1/2W	J	CF	47 1/2W	J
R160,R260,R360	MX	330 5W	J	MX	390 5W	J
L101,L201,L301	LAL04TR47M			LAL04TR82M		
L102,L202,L302	LAL04TR82M			LAL04T1R5M		

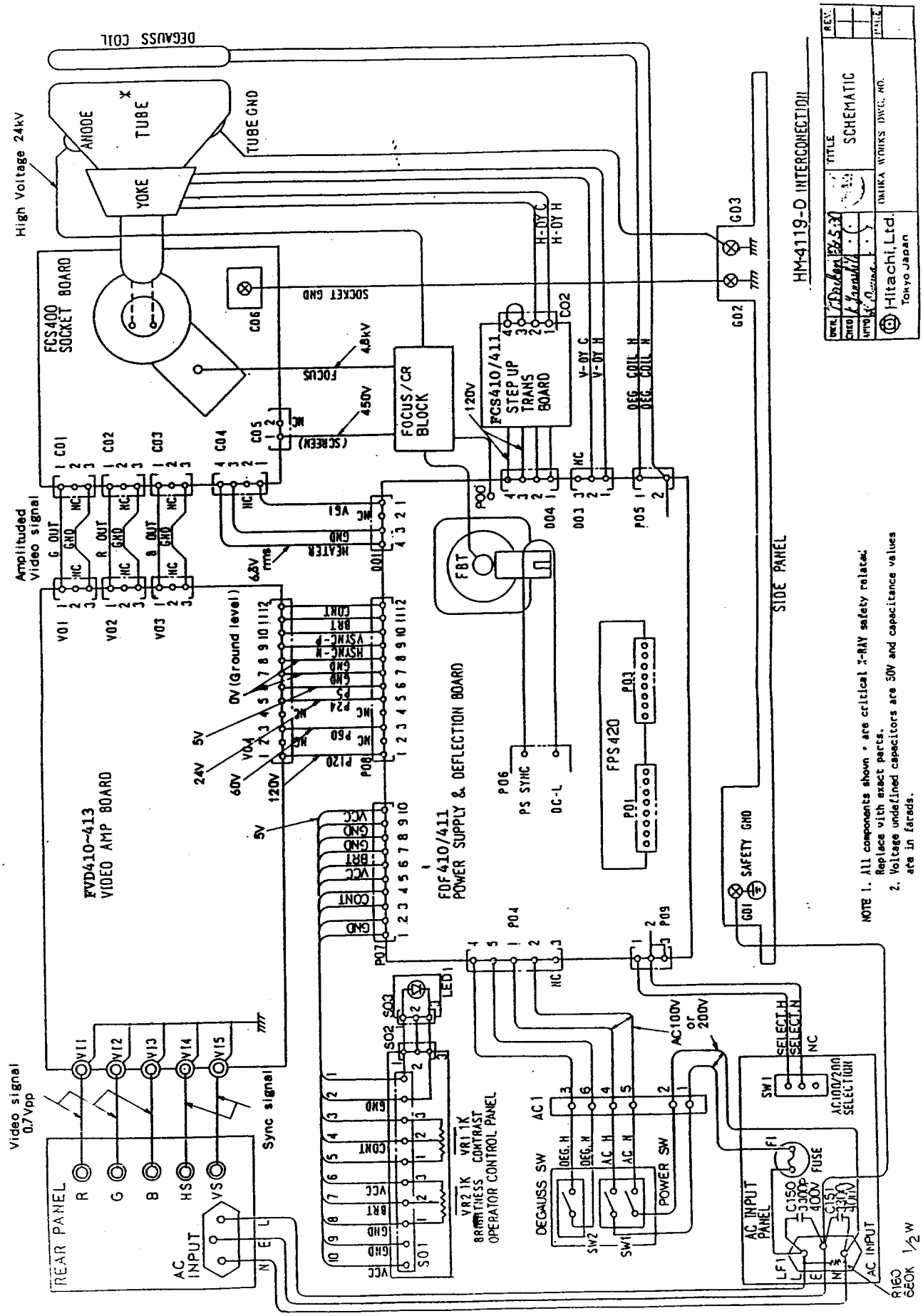

DEGAUSS COIL
High Voltage 24kV
ANODE
TUBE
YOKE
TUBE GND
FCS400
SOCKET BOARD
SOCKET GND
FOCUS
4.8kV
450V
FOCUS/CR
BLOCK
120V
FCS410/411
STEP UP
TRANS
BOARD
H-DY C
H-DY H
V-DY C
V-DY H
DEG COIL H
DEG COIL N
HM-4119-O INTERCONNECTION
SCHEMATIC
Hitachi, Ltd.
Tokyo Japan
Amplituded
Video signal
G OUT
R OUT
B OUT
GND
NC
6.8V rms
HEATER
FBT
SIDE PANEL
FVD410-413
VIDEO AMP BOARD
0V (Ground level)
5V
24V
60V
120V
FDF410/411
POWER SUPPLY & DEFLECTION BOARD
PS SYNC
DC-L
FPS420
SAFETY GND
CONT
BRT
VSYNC-P
VSYNC-N
HSYNC-P
GND
VCC
P5
P24
P60
P120
NOTE 1. All components shown * are critical X-RAY safety related.
Replace with exact parts.
2. Voltage undefined capacitors are 50V and capacitance values
are in farads.
Video signal
0.7Vpp
Sync signal
REAR PANEL
R
G
B
HS
VS
AC
INPUT
VR2 1K
BRIGHTNESS
VR1 1K
CONTRAST
OPERATOR CONTROL PANEL
LED1
DEGAUSS SW
POWER SW
AC100V
or
200V
SELECT H
SELECT N
AC100/200
SELECTION
AC INPUT
PANEL
F1
3.15A
250V
FUSE
C150
3300P
400V
C151
0.01
400V
R160
680K 1/2W

Fig. 7-1

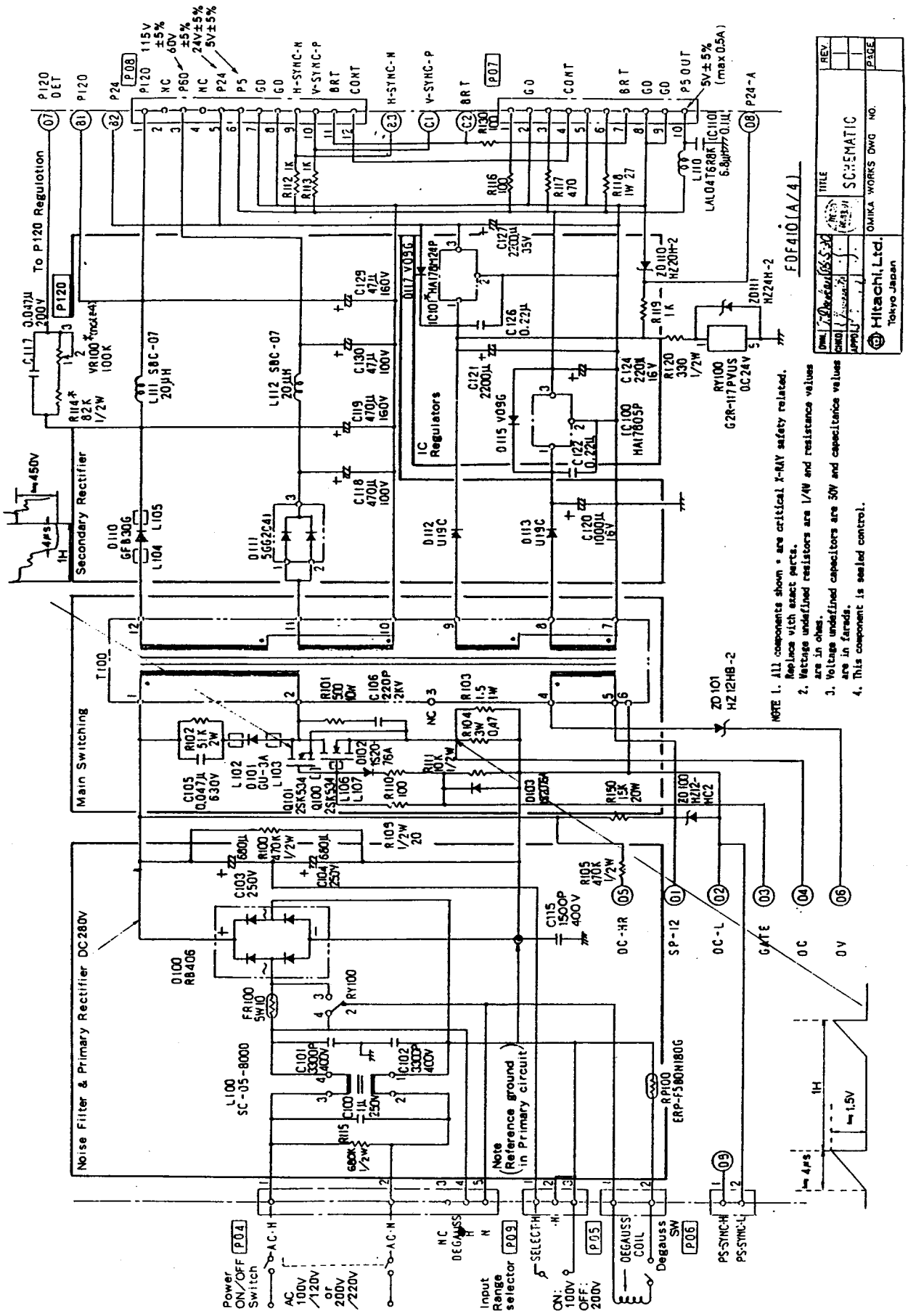

Noise Filter & Primary Rectifier DC280V
Main Switching
Secondary Rectifier
IC Regulators
To P120 Regulation
Power ON/OFF Switch
AC 100V /120V or 200V /220V
Input Range selector
ON: 100V OFF: 200V
Degauss SW
Degauss COIL
Note (Reference ground in Primary circuit)
SCHEMATIC
Hitachi, Ltd.
Tokyo Japan
OMIKA WORKS DWG NO.
FOF410(A/4)
NOTE 1. All components shown * are critical X-RAY safety related. Reluce with exact parts.
2. Voltage undefined resistors are 1/4W and resistance values are in ohms.
3. Voltage undefined capacitors are 50V and capacitance values are in farads.
4. This component is sealed control.

Fig. 7-2

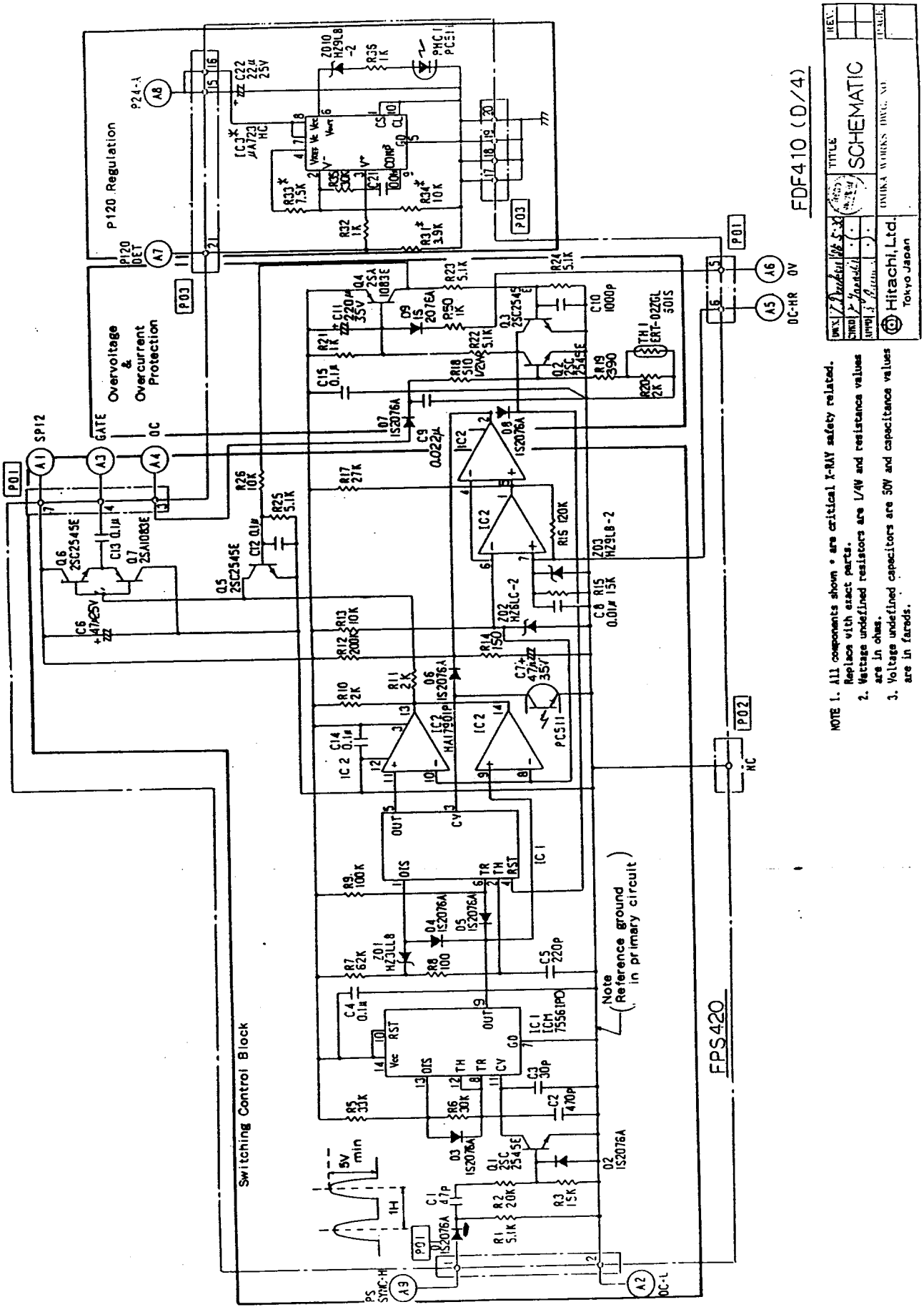

FDF410 (D/4)
SCHEMATIC
Hitachi, Ltd.
Tokyo Japan
FPS420
Switching Control Block
P120 Regulation
Overvoltage & Overcurrent Protection
Note Reference ground in primary circuit
NOTE 1. All components shown • are critical X-RAY safety related. Replace with exact parts.
2. Wattage undefined resistors are 1/4W and resistance values are in ohms.
3. Voltage undefined capacitors are 50V and capacitance values are in farads.

Fig. 7-3

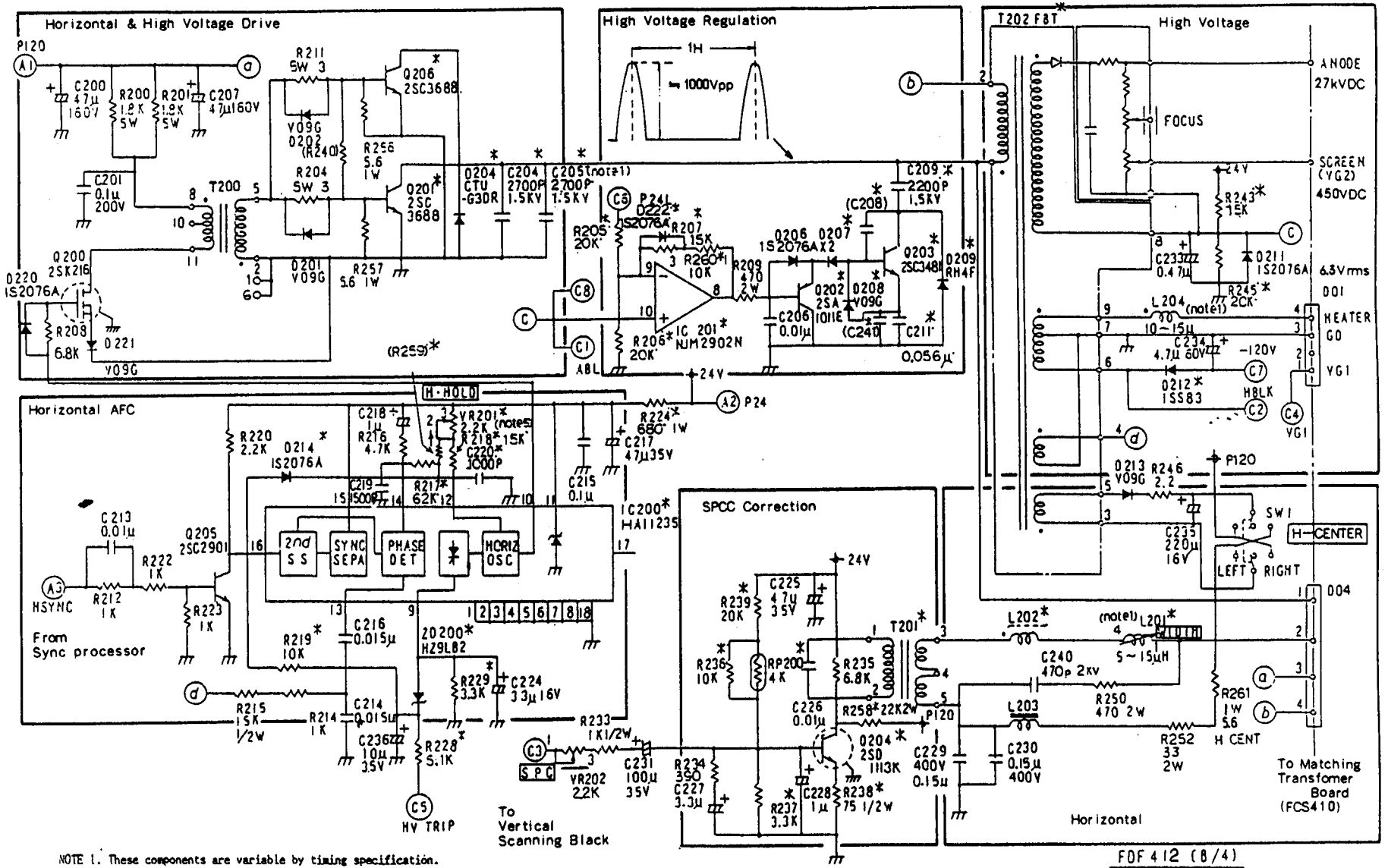


Fig. 7-4

NOTE 1. These components are variable by timing specification.
2. All components shown * are critical X-RAY safety related. Replace with exact parts.
3. Wattage undefined resistors are 1/4W and resistance values are in ohms.
4. Voltage undefined capacitors are 50V and capacitance values are in farads.
5. This component is sealed control.

DWN		TITLE	REV.
CHKD		SCHEMATIC	
APPD			
Hitachi, Ltd. Tokyo Japan		OMIKA WORKS DWG NO.	PAGE

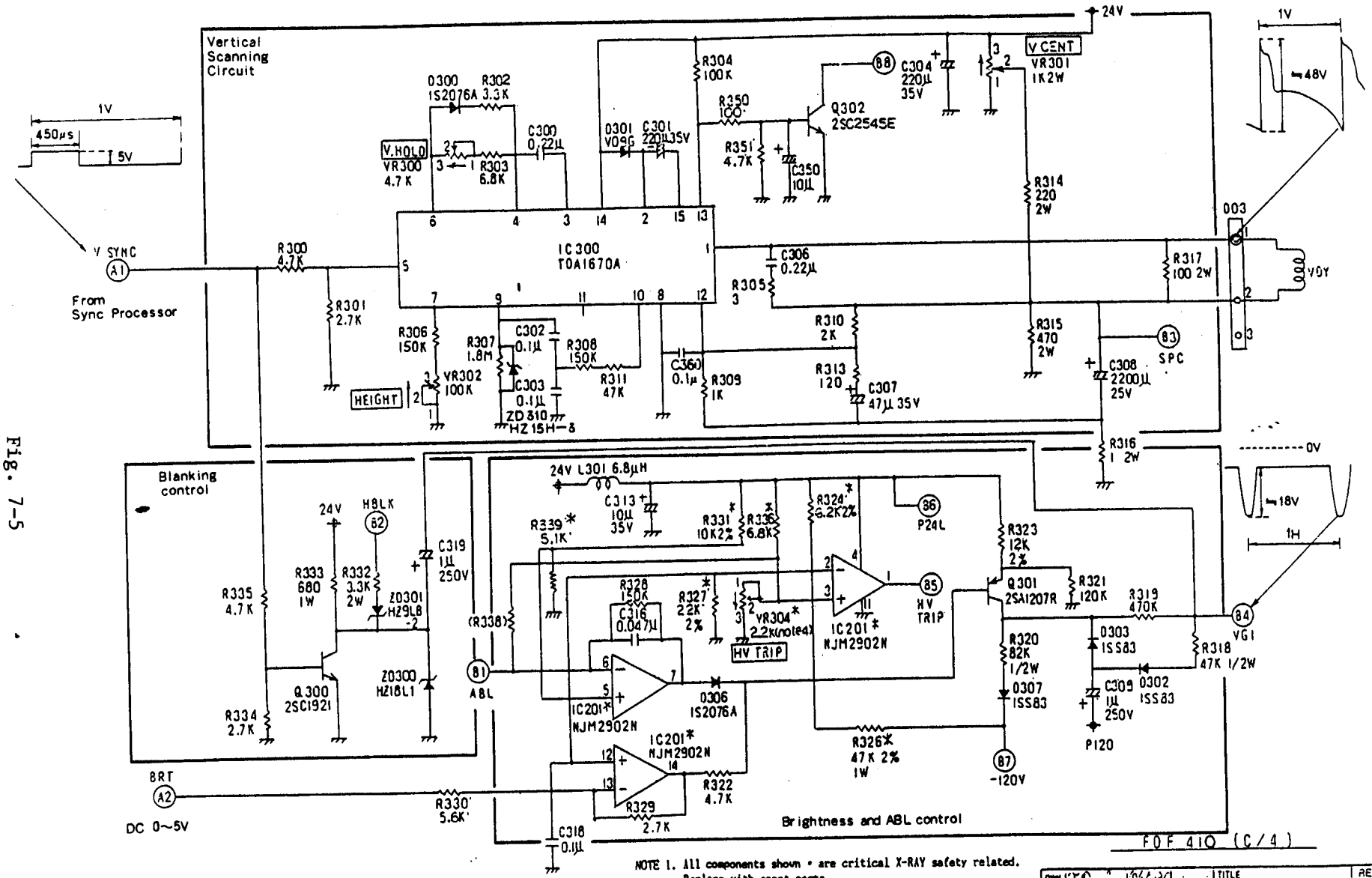
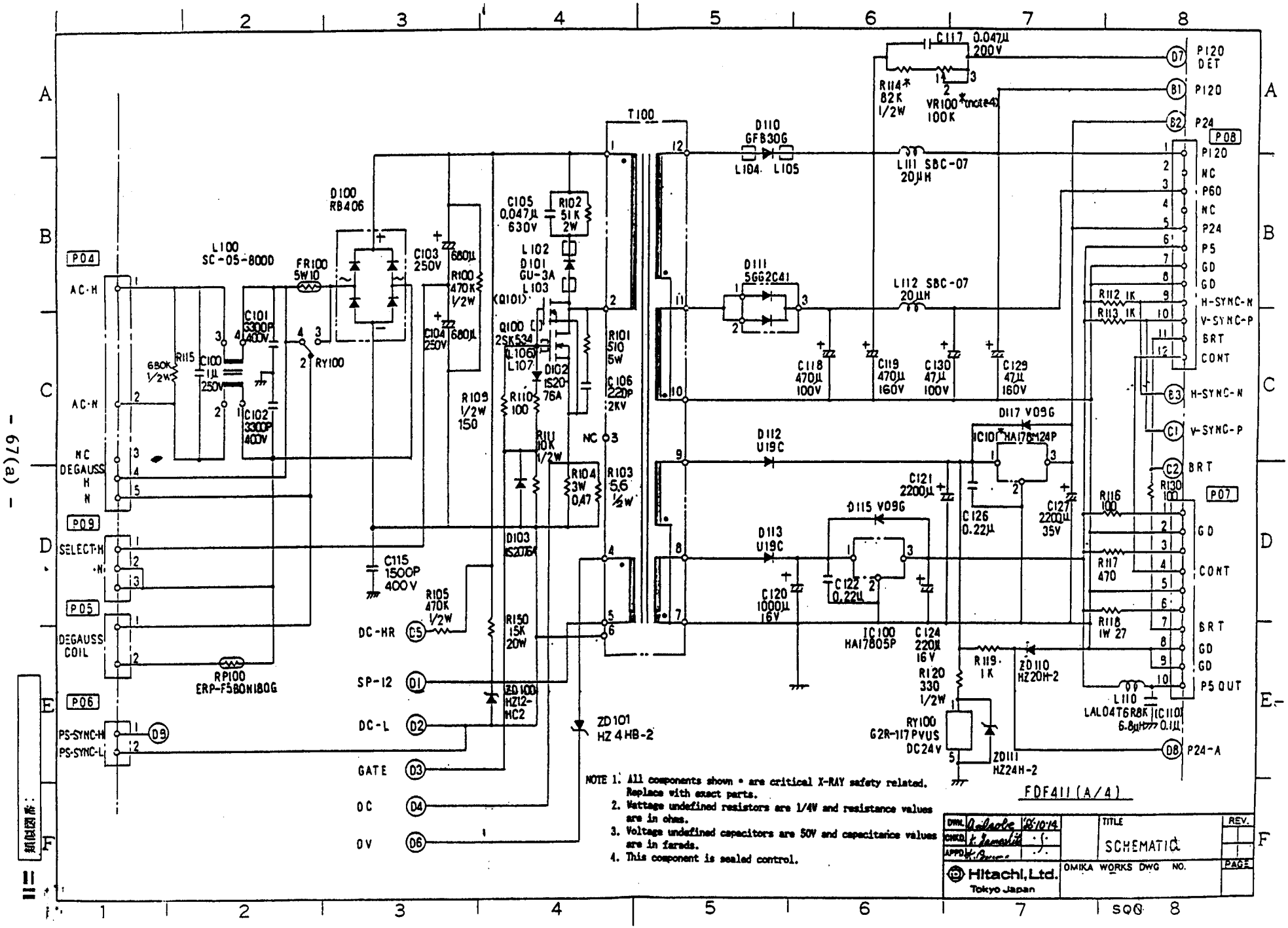


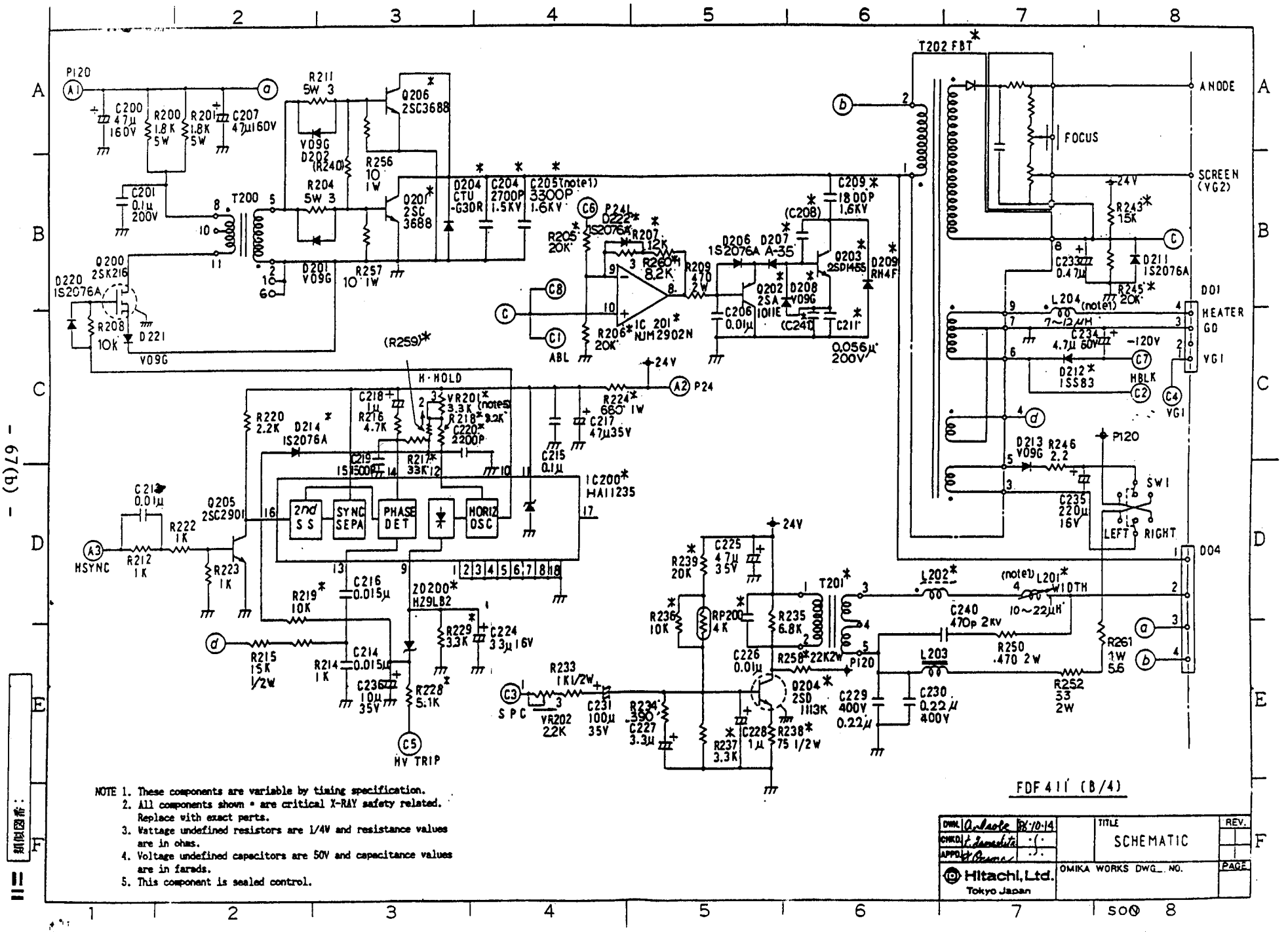
Fig. 7-5

FOF 410 (C/4)

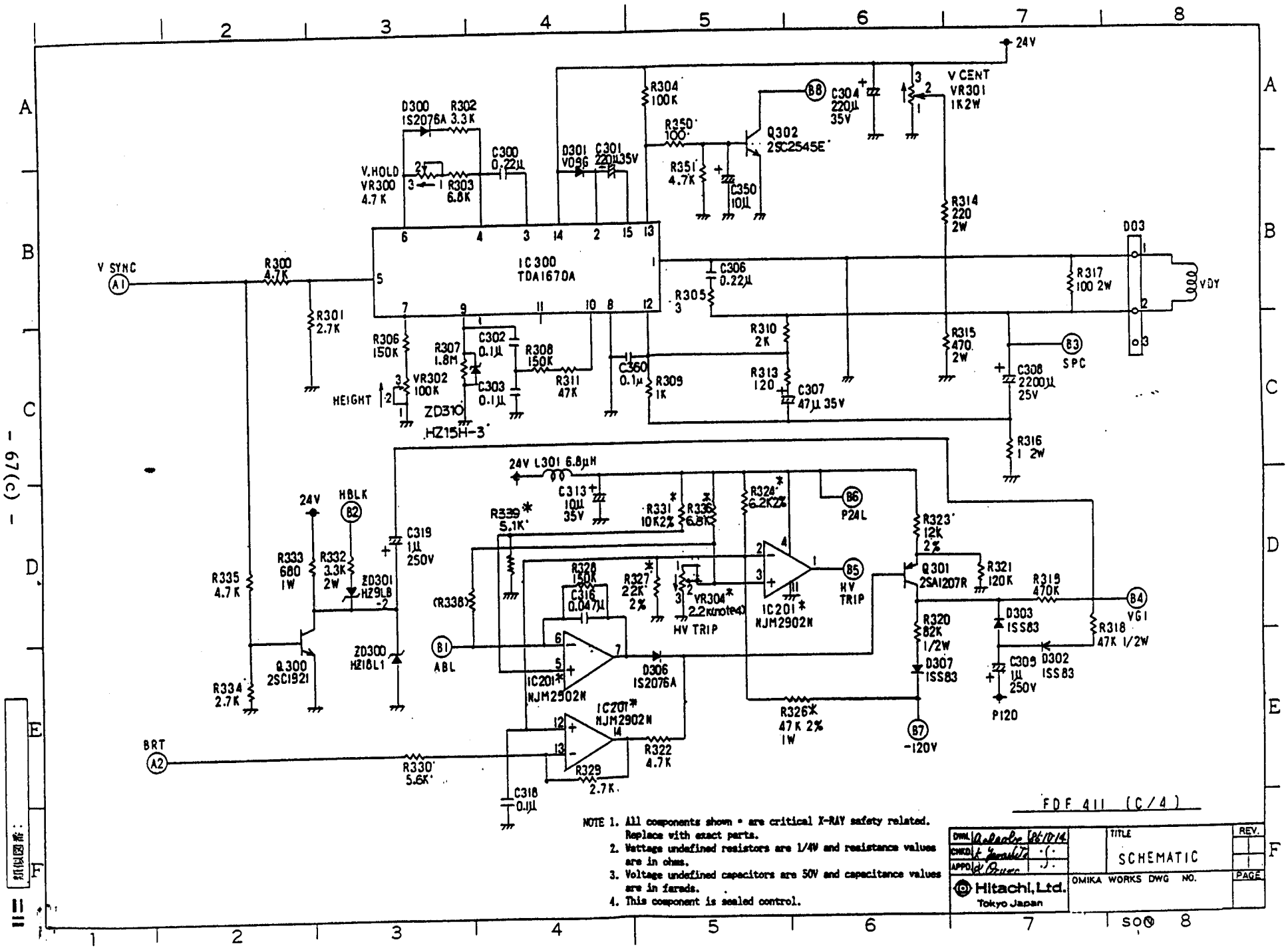
NOTE 1. All components shown * are critical X-RAY safety related. Replace with exact parts.
2. Wattage undefined resistors are 1/4W and resistance values are in ohms.
3. Voltage undefined capacitors are 50V and capacitance values are in farads.
4. This component is sealed control.

DWN		TITLE	REV.
CHKD		SCHEMATIC	
APPD			
Hitachi, Ltd. Tokyo Japan		OMIKA WORKS OWG NO.	PAGE


P04
AC-H
AC-N
NC
DEGAUSS
H
N
P09
SELECT-H
-N
P05
DEGAUSS
COIL
P06
PS-SYNC-H
PS-SYNC-L
D9
L100
SC-05-8000
FR100
5W10
RY100
RP100
ERP-F580N180G
R115
680K
1/2W
C100
1μ
250V
C101
3300P
400V
C102
3300P
400V
D100
RB406
C103
250V
680μ
R100
470K
1/2W
C104
250V
680μ
R109
1/2W
150
C105
0.047μ
630V
R102
51K
2W
L102
D101
GU-3A
L103
(Q101)
Q100
2SK534
L106
L107
D102
1S20-
76A
R110
100
R111
10K
1/2W
NC
R104
3W
0.47
R103
5.6
1/2W
C106
220P
2KV
T100
C115
1500P
400V
R105
470K
1/2W
D103
1S2076A
R150
15K
20W
ZD100
HZ12-
MC2
ZD101
HZ 4HB-2
DC-HR
D5
SP-12
D1
DC-L
D2
GATE
D3
OC
D4
OV
D6
D110
GFB30G
L104
L105
D111
5GG2C41
D112
U19C
D113
U19C
L111 SBC-07
20μH
L112 SBC-07
20μH
C117 0.047μ
200V
R114*
82K
1/2W
VR100*(note4)
100K
C118
470μ
100V
C119
470μ
160V
C130
47μ
100V
C129
47μ
160V
D117 V09G
IC101*HA178M24P
C121
2200μ
C126
0.22μ
C127
2200μ
35V
D115 V09G
C122
0.22μ
C120
1000μ
16V
IC100
HA17805P
C124
220μ
16V
R120
330
1/2W
R119
1K
RY100
G2R-1-17PVUS
DC24V
ZD110
HZ20H-2
ZD111
HZ24H-2
L110
LAL04T6R8K
6.8μH
IC110
0.1μ
D7 P120 DET
B1 P120
B2 P24
P08
1 P120
2 NC
3 P60
4 NC
5 P24
6 P5
7 GD
8 GD
9 H-SYNC-N
10 V-SYNC-P
11 BRT
12 CONT
R112 1K
R113 1K
B3 H-SYNC-N
C1 V-SYNC-P
C2 BRT
P07
R130
100
1 GD
2 CONT
3 BRT
4 GD
5 GD
6 P5 OUT
R116
100
R117
470
R118
1W 27
D8 P24-A
NOTE 1. All components shown • are critical X-RAY safety related. Replace with exact parts.
2. Wattage undefined resistors are 1/4W and resistance values are in ohms.
3. Voltage undefined capacitors are 50V and capacitance values are in farads.
4. This component is sealed control.
FDF411(A/4)
DWN
DWD
APPD
Hitachi, Ltd.
Tokyo Japan
TITLE
SCHEMATIC
REV.
OMIKA WORKS DWG NO.
PAGE



NOTE 1. These components are variable by timing specification.
2. All components shown * are critical X-RAY safety related. Replace with exact parts.
3. Wattage undefined resistors are 1/4W and resistance values are in ohms.
4. Voltage undefined capacitors are 50V and capacitance values are in farads.
5. This component is sealed control.

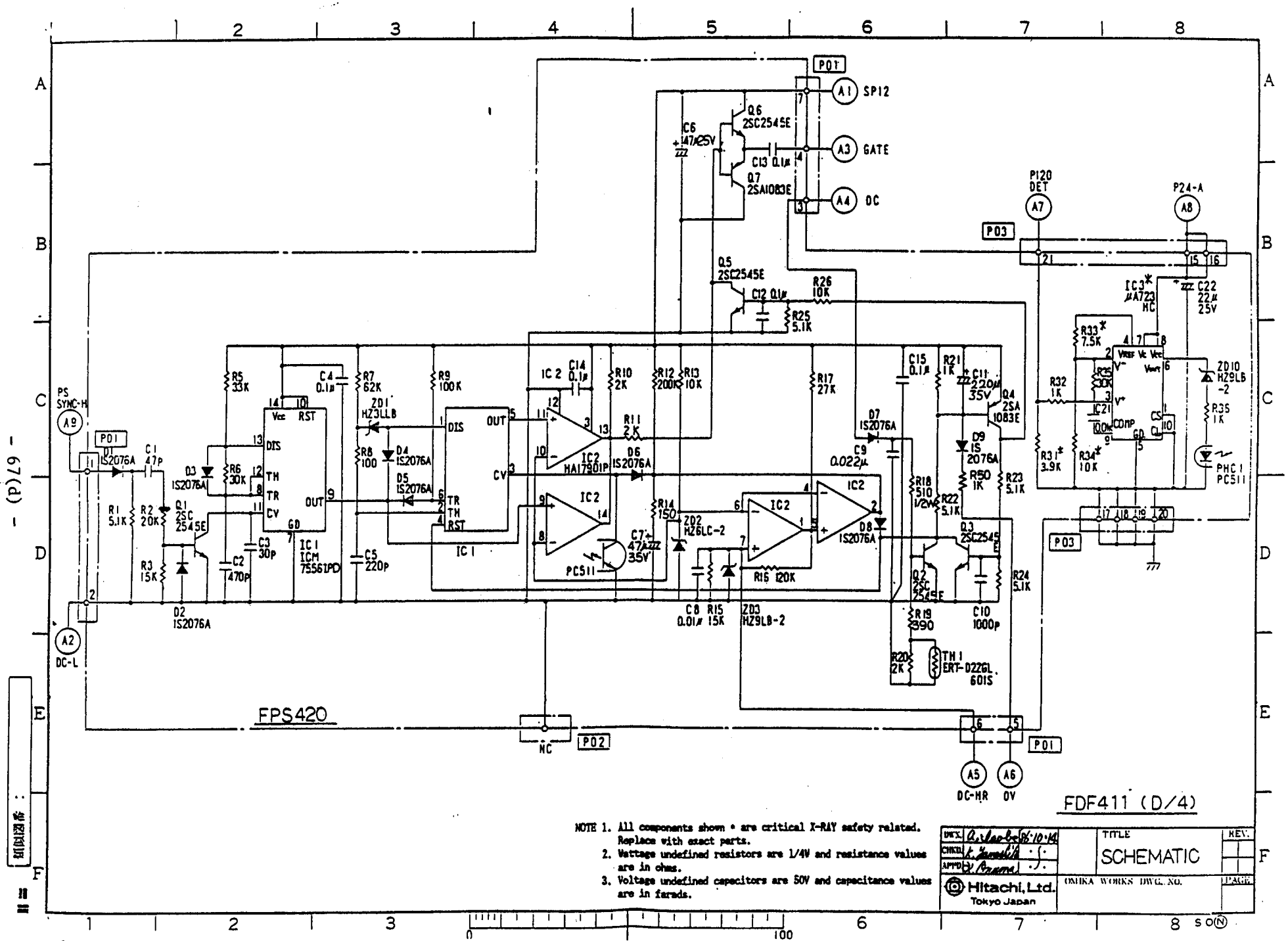


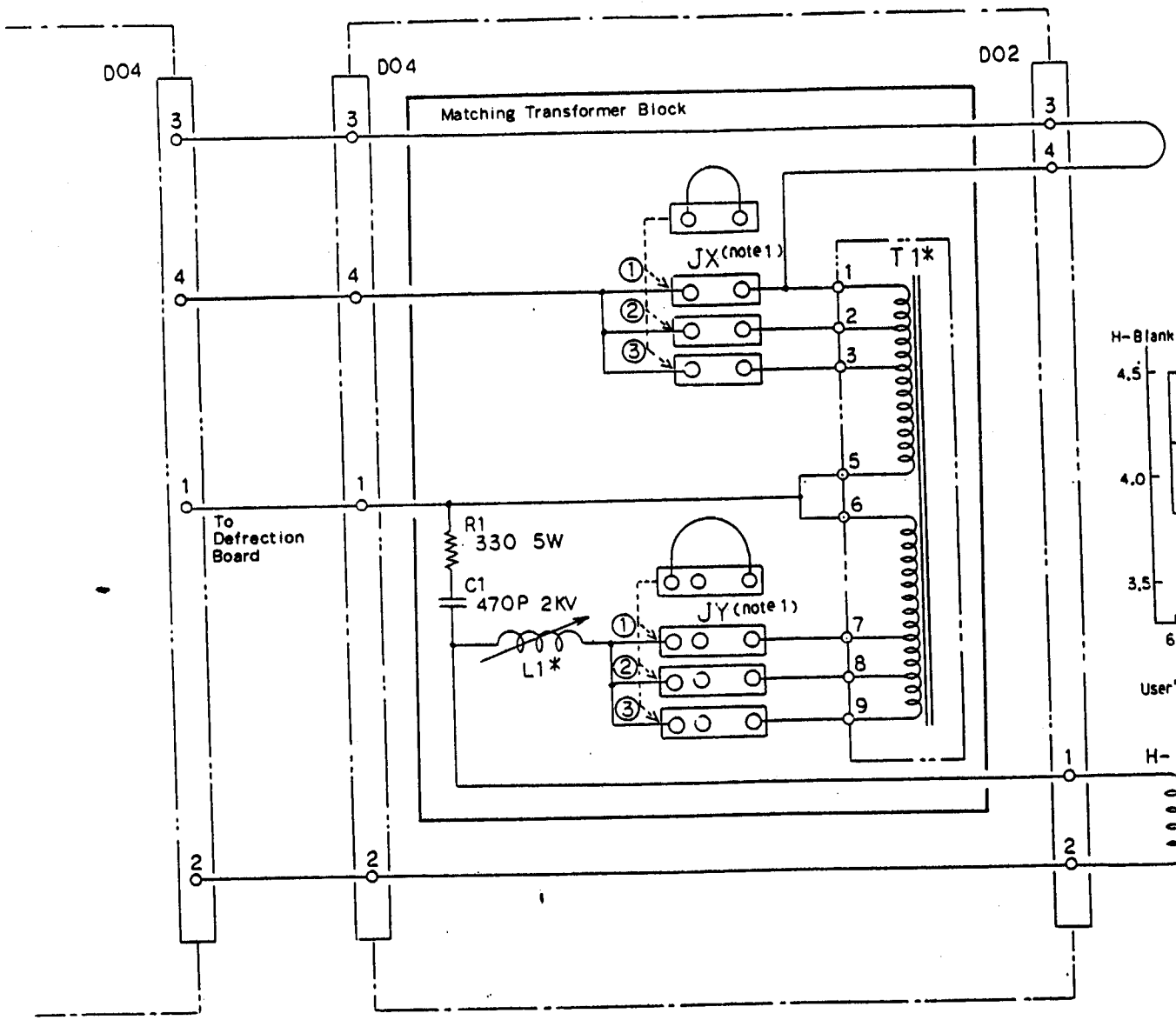
FDF 411 (C/4)

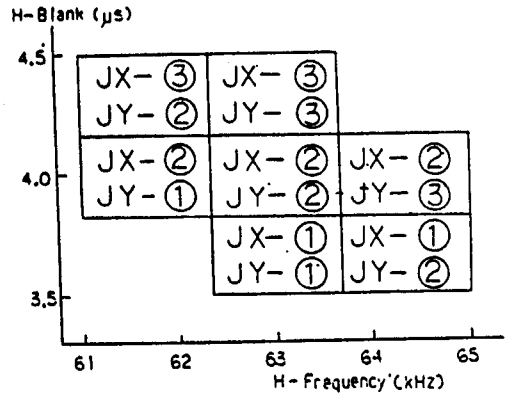
NOTE 1. All components shown * are critical X-RAY safety related. Replace with exact parts.
2. Wattage undefined resistors are 1/4W and resistance values are in ohms.
3. Voltage undefined capacitors are 50V and capacitance values are in farads.
4. This component is sealed control.

DWN	Nakaoka	86/10/14	TITLE: SCHEMATIC
CHKD	K. Yamauchi		REV.
APPD	K. Ozawa		
Hitachi, Ltd. Tokyo Japan			OMIKA WORKS DWG NO.
			PAGE

- 67(c) -


FPS420
FDF411 (D/4)
SCHEMATIC
Hitachi, Ltd.
Tokyo Japan
NOTE 1. All components shown * are critical X-RAY safety related. Replace with exact parts.
2. Wattage undefined resistors are 1/4W and resistance values are in ohms.
3. Voltage undefined capacitors are 50V and capacitance values are in farads.





User's input timing VS Tap selection JX, JY

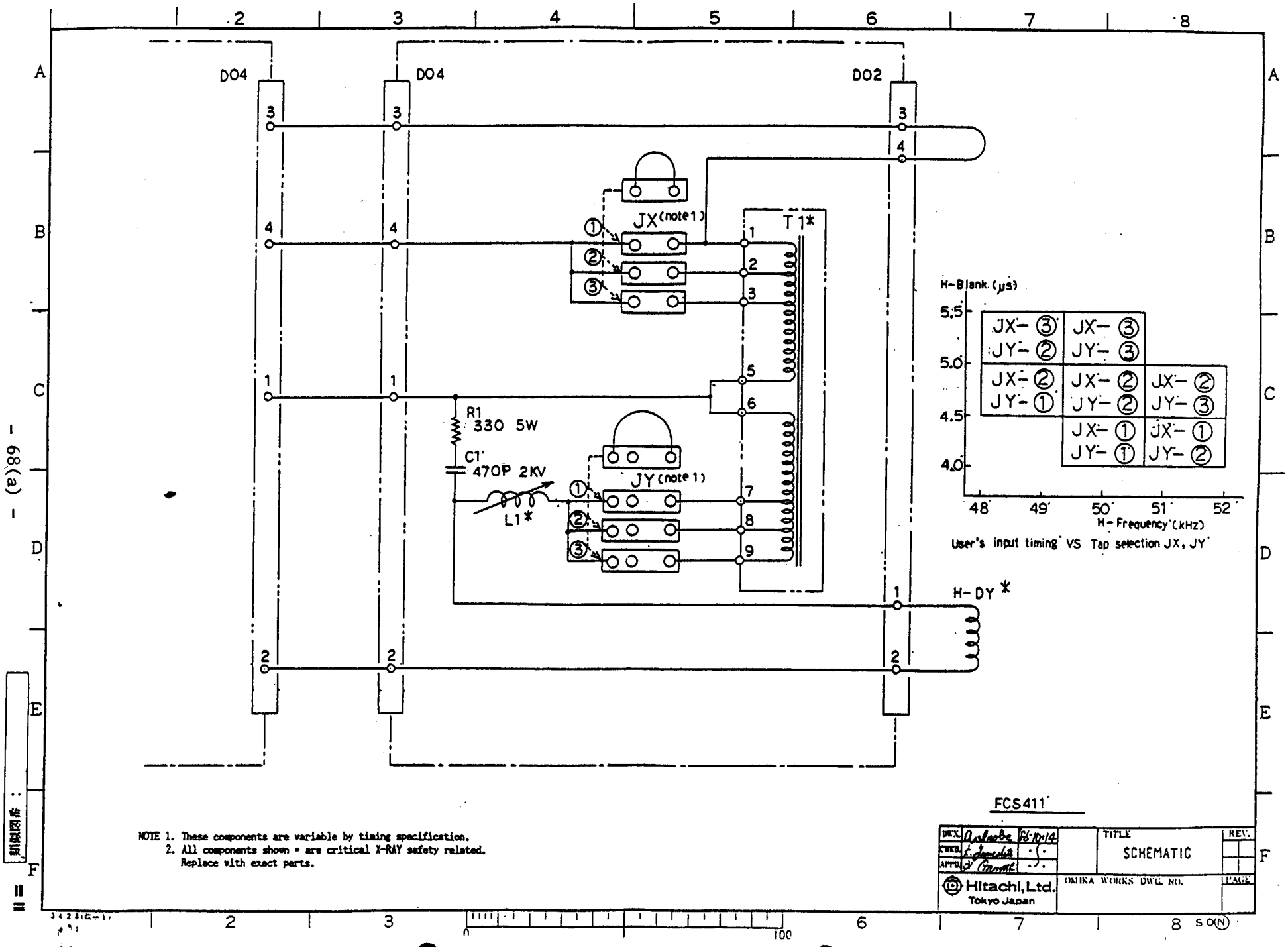
highen HV

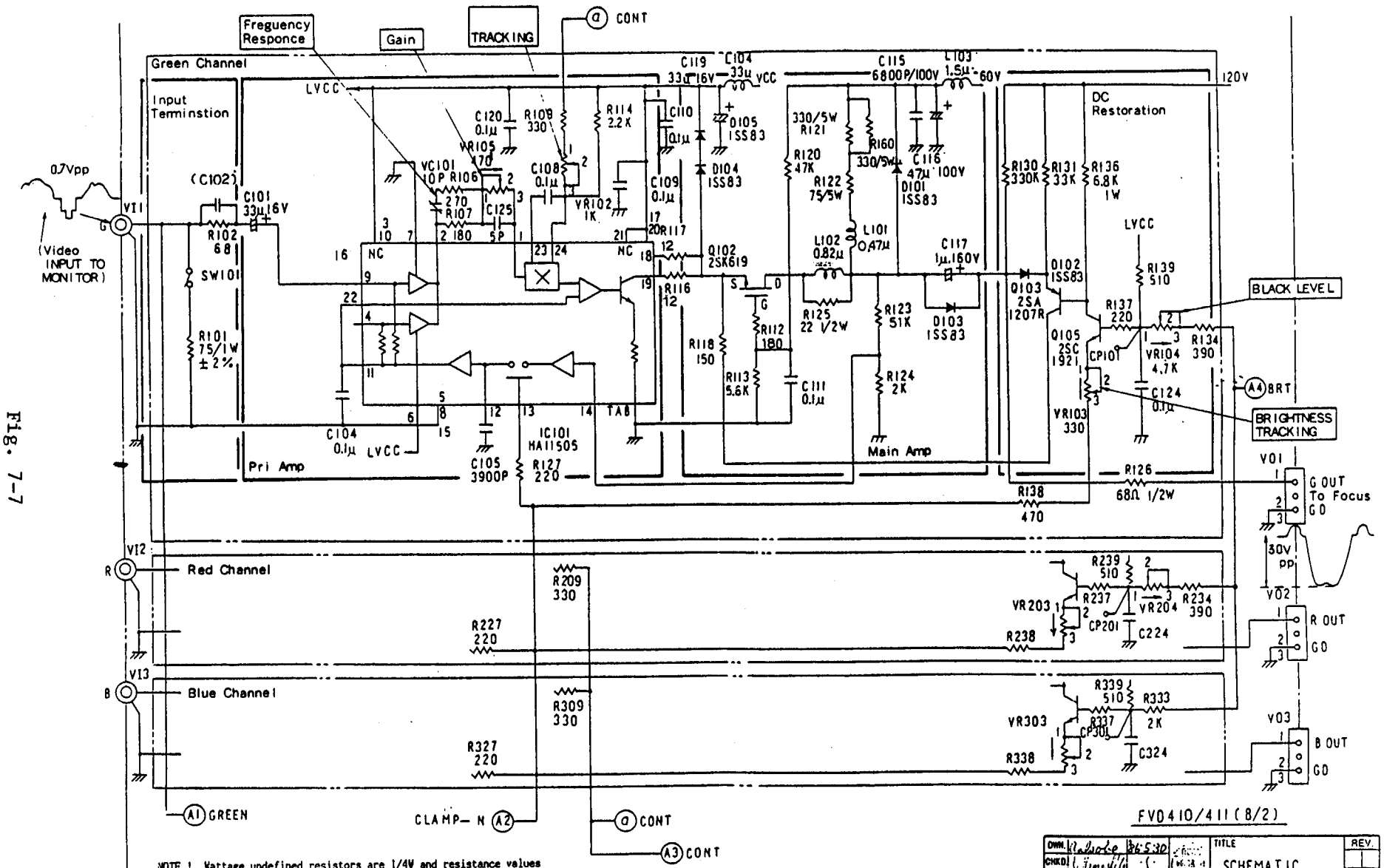
Fig. 7-6

NOTE 1. These components are variable by timing specification.
2. All components shown • are critical X-RAY safety related. Replace with exact parts.

FCS410

DWN	T. Tanaka 86.5.30	TITLE	REV.
CHKD	K. Imanishi	SCHEMATIC	
APPD	T. Nomura		
Hitachi, Ltd. Tokyo Japan		OMIKA WORKS DWG. NO.	PAGE


DO4
DO4
DO2
JX (note 1)
T 1*
R1
330 5W
C1
470P 2KV
L1*
JY (note 1)
H-DY *
H-Blank. (μs)
5.5
5.0
4.5
4.0
48
49
50
51
52
H-Frequency (kHz)
JX- ③ JY- ②
JX- ③ JY- ③
JX- ② JY- ①
JX- ② JY- ②
JX- ② JY- ③
JX- ① JY- ①
JX- ① JY- ②
User's input timing VS Tap selection JX, JY
FCS411
NOTE 1. These components are variable by timing specification.
2. All components shown * are critical X-RAY safety related.
Replace with exact parts.
DWN
CHKD
APPD
TITLE
SCHEMATIC
REV.
Hitachi, Ltd.
Tokyo Japan
OHIKA WORKS DWG. NO.
PAGE



NOTE 1. Wattage undefined resistors are 1/4W and resistance values are in ohms.
2. Voltage undefined capacitors are 50V and capacitance values are in farads.

FV0410/411(B/2)

DWN. Nakada 86.5.30		TITLE	REV.
CHKD.		SCHEMATIC	
APPD.			
Hitachi, Ltd. Tokyo Japan		OMIKA WORKS DWG. NO.	PAGE

Fig. 7-7

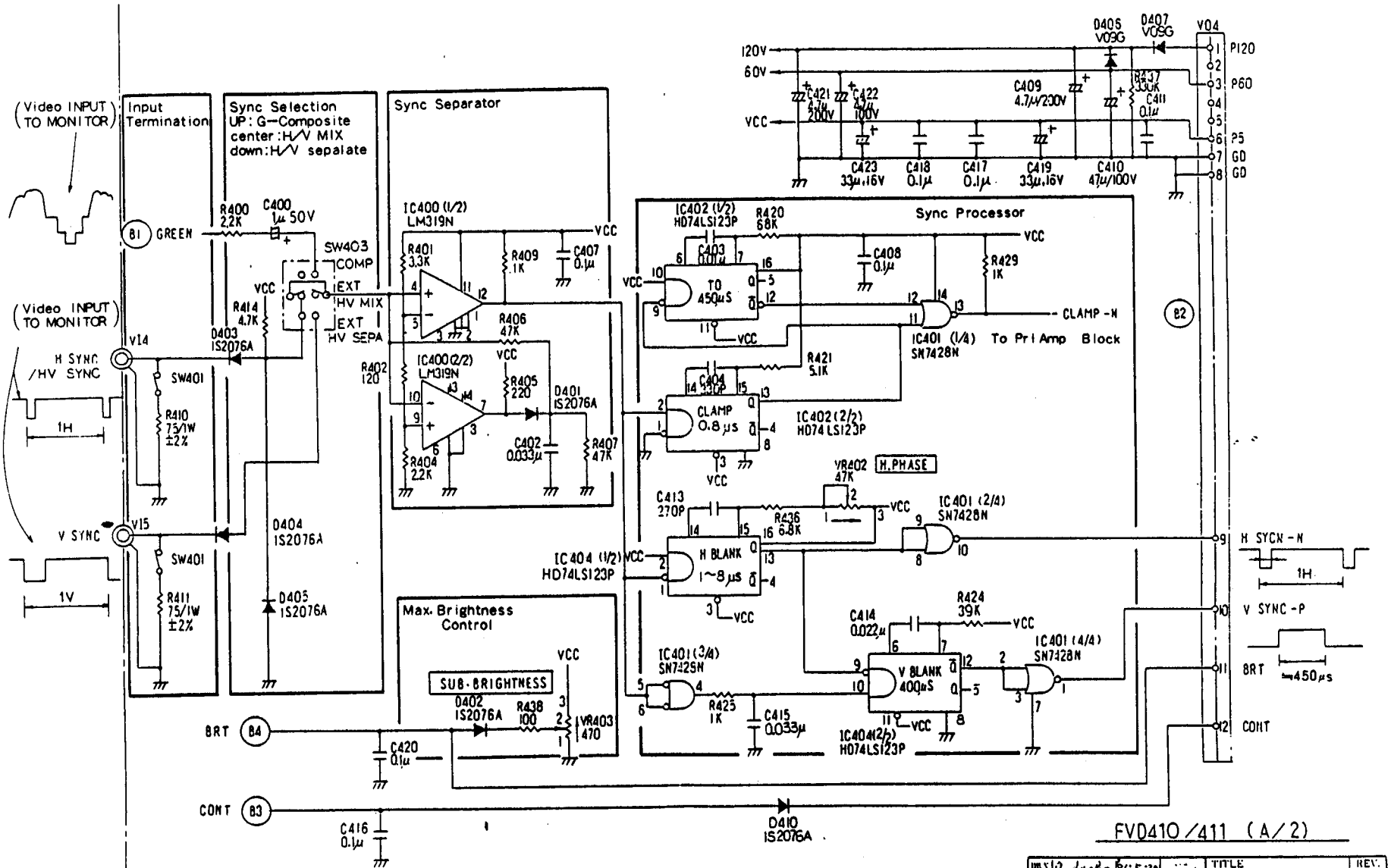
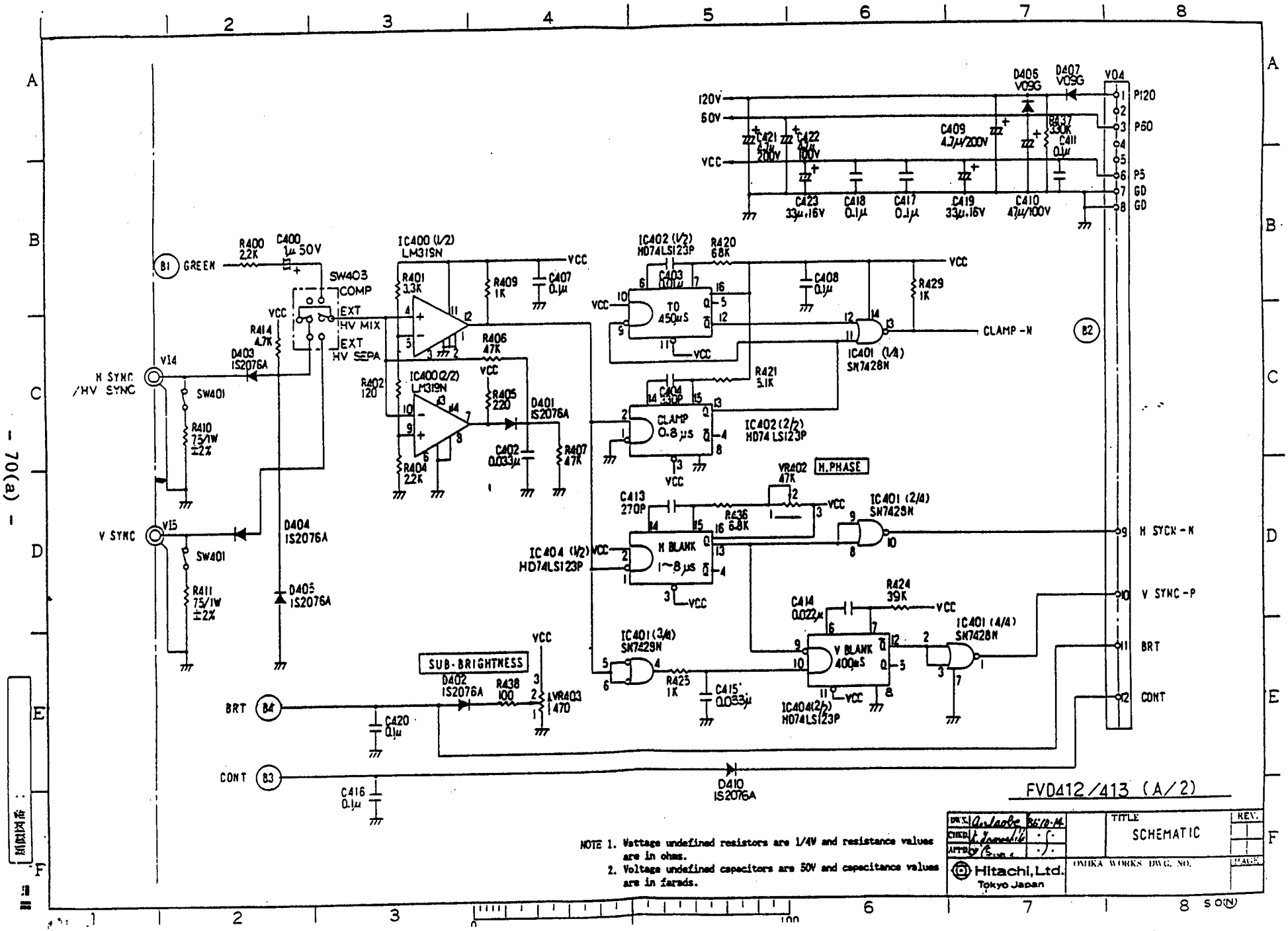


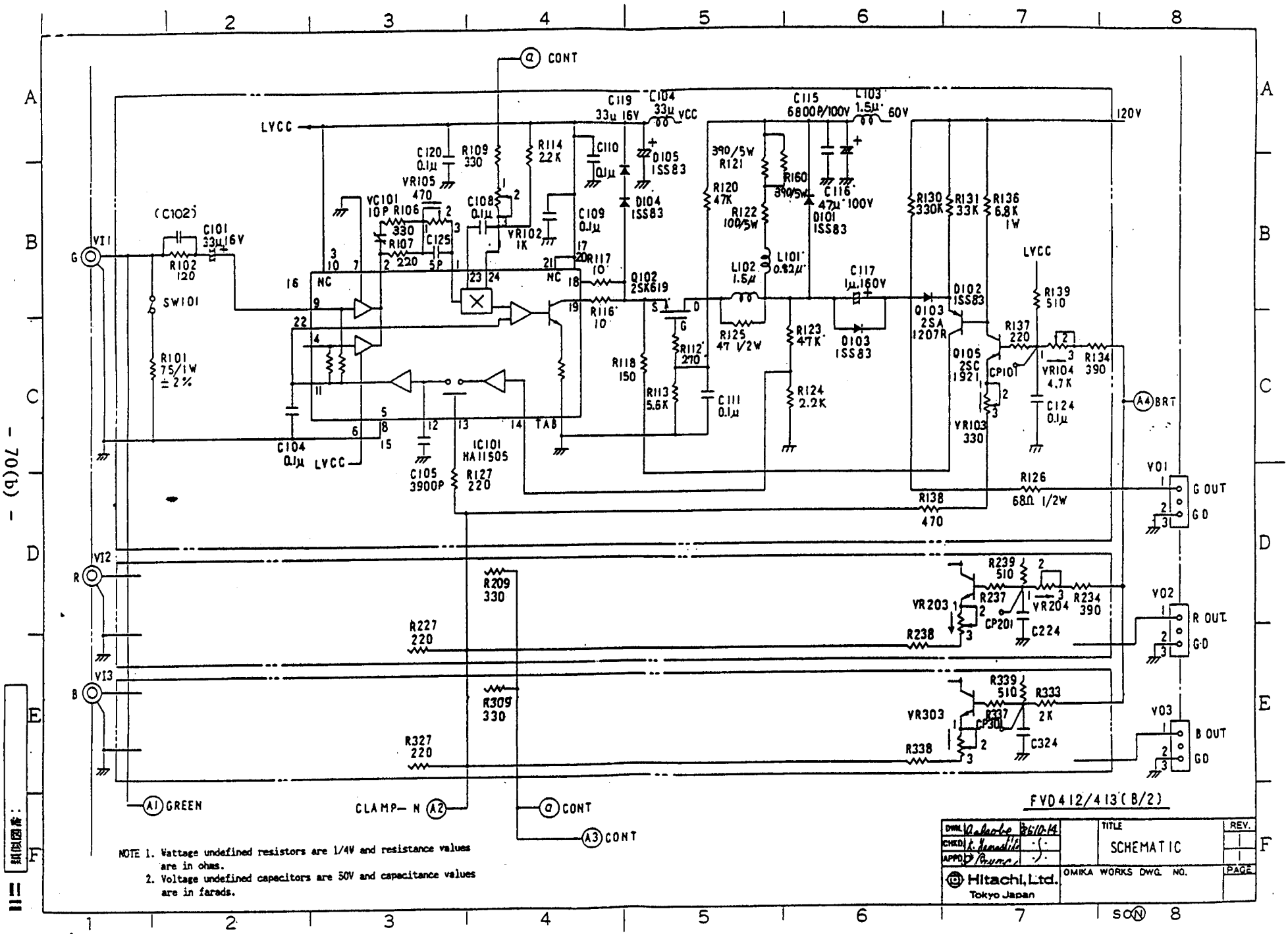
Fig. 7-8

FVD410/411 (A/2)

NOTE 1. Vattage undefined resistors are 1/4W and resistance values are in ohms.
2. Voltage undefined capacitors are 50V and capacitance values are in farads.

DRWN		TITLE	REV.
CHKD		SCHEMATIC	
APPD			
Hitachi, Ltd. Tokyo Japan		OMIKA WORKS DWG. NO.	PAGE


120V
50V
VCC
D405 V09G
D407 V09G
V04
P120
P50
P5
GD
GD
C421 4.7μ 200V
C422 47μ 100V
C409 4.7μ/200V
R437 330K
C411 0.1μ
C423 33μ,16V
C418 0.1μ
C417 0.1μ
C419 33μ.16V
C410 47μ/100V
B1 GREEN
R400 2.2K
C400 1μ 50V
SW403
COMP
EXT HV MIX
EXT HV SEPA
IC400 (1/2) LM319N
R401 3.3K
R409 1K
C407 0.1μ
R406 47K
IC400 (2/2) LM319N
R402 120
R405 220
D401 IS2076A
C402 0.033μ
R407 47K
R404 2.2K
R414 4.7K
D403 IS2076A
V14
H SYNC /HV SYNC
SW401
R410 75/1W ±2%
V15
V SYNC
D404 IS2076A
D406 IS2076A
R411 75/1W ±2%
IC402 (1/2) HD74LS123P
R420 6.8K
C403 100μ
C408 0.1μ
R429 1K
TO 450μS
CLAMP -N
B2
IC401 (1/4) SN7428N
R421 5.1K
C404 330P
CLAMP 0.8 μs
IC402 (2/2) HD74LS123P
VR402 47K
H.PHASE
C413 270P
R436 6.8K
IC401 (2/4) SN7428N
H SYCN - N
IC404 (1/2) HD74LS123P
H BLANK ~8 μs
R424 39K
C414 0.022μ
IC401 (4/4) SN7428N
V SYNC - P
IC401 (3/4) SN7428N
V BLANK 400μS
BRT
SUB-BRIGHTNESS
D402 IS2076A
R438 100
VR403 470
R425 1K
C415 0.033μ
IC404 (2/2) HD74LS123P
B4
C420 0.1μ
CONT
B3
C416 0.1μ
D410 IS2076A
CONT
FVD412/413 (A/2)
NOTE 1. Wattage undefined resistors are 1/4W and resistance values are in ohms.
2. Voltage undefined capacitors are 50V and capacitance values are in farads.
DWN A. Saabe 86.10.14
CHKD K. Yamauchi
APPD S. Ueno
Hitachi, Ltd.
Tokyo Japan
TITLE
SCHEMATIC
REV.
ONIKA WORKS DWG. NO.
PAGE


CONT
LVCC
120V
C119 33μ 16V
C104 33μ VCC
C115 6800P/100V
L103 1.5μ 60V
C120 0.1μ
R109 330
R114 2.2K
C110 0.1μ
D105 1SS83
D104 1SS83
VR105 470
VC101 10P
R106 330
C108 0.1μ
C109 0.1μ
VR102 1K
R107 330
C125 220 5P
R117 10
Q102 2SK619
R116 10
R118 150
R112 270
R113 5.6K
C111 0.1μ
R123 47K
R124 2.2K
R125 47 1/2W
L102 1.5μ
L101 0.82μ
C117 1μ 160V
D103 1SS83
390/5W R121
R120 47K
R122 100/5W
R160 390/5W
C116 47μ 100V
D101 1SS83
R130 330K
R131 33K
R136 6.8K 1W
Q103 2SA 1207R
D102 1SS83
R139 510
R137 220
Q105 2SC 1921
CP101
VR104 4.7K
R134 390
VR103 330
C124 0.1μ
A4 BRT
(C102)
C101 33μ 16V
R102 120
SW101
R101 75/1W ±2%
C104 0.1μ LVCC
C105 3900P
IC101 HA11505
R127 220
R126 68Ω 1/2W
R138 470
VI1
G
VI2
R
VI3
B
R209 330
R227 220
R309 330
R327 220
R239 510
R237
VR203
CP201
VR204
R234 390
C224
R238
R339 510
R333
R337
VR303
CP301
2K
C324
R338
VO1
G OUT
G GD
VO2
R OUT
G GD
VO3
B OUT
G GD
A1 GREEN
CLAMP— N A2
CONT
A3 CONT
FVD412/413(B/2)
DWN Sakaibe 86/10/14
CHKD K. Yamashita
APPD D. Furuse
TITLE
SCHEMATIC
REV.
Hitachi, Ltd.
Tokyo Japan
OMIKA WORKS DWG. NO.
PAGE
NOTE 1. Wattage undefined resistors are 1/4W and resistance values are in ohms.
2. Voltage undefined capacitors are 50V and capacitance values are in farads.

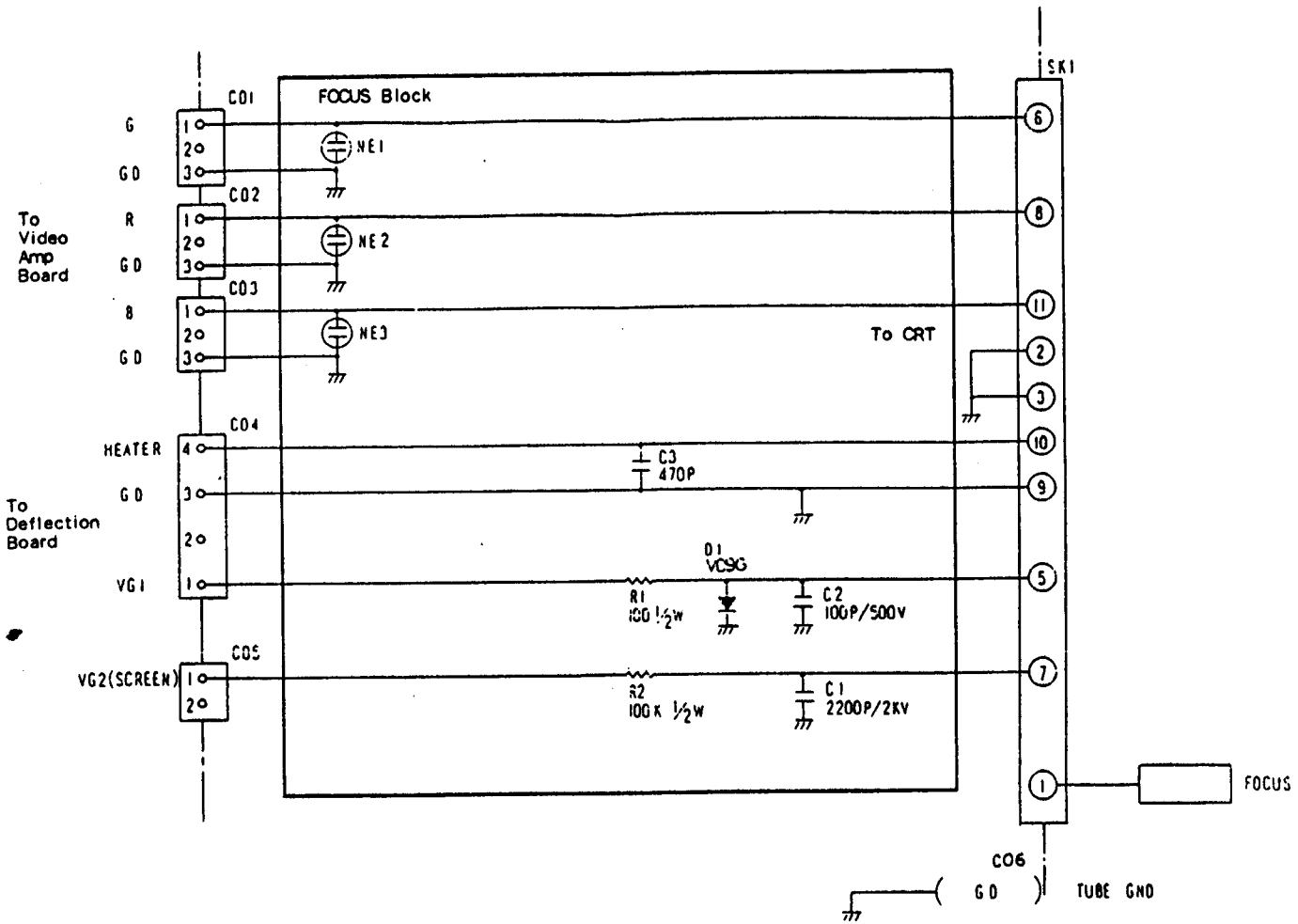


Fig. 7-9

NOTE 1. Wattage undefined resistors are 1/4W and resistance values are in ohms.
2. Voltage undefined capacitors are 50V and capacitance values are in farads.

FCS400

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